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Khrushchev Goes Nap on Production

IN his opening speech to the 21st congress of the Communist Party of the Soviet Union, Mr. Khrushchev promised the Russians less work, more food, and a tax-free future in which they would beat the West in peaceful competition. In thus donning the mantle of an economic Messiah, he seems to have taken up a position from which he cannot withdraw without suffering the fate commonly experienced by dictators who fail to deliver the goods.

In view of the immense resources of manpower and raw materials at his disposal, and of the immense strides which Russia has made industrially since the war, few Western economists would be rash enough to predict that on this occasion Mr. Khrushchev has promised more than can be performed. Nevertheless it is perhaps valid criticism that by still further accentuating the present state of imbalance in the Russian economy, the latest development plan seems liable to create as many problems as it can solve.

Indicative of the crucial importance attached by the present leadership to the national economic plan was the unusual speed with which the results for 1958 were made available. The maximum material and financial resources, states the report of the Central Statistical Board, were directed towards accomplishing the main tasks of the plan, which called for accelerated development of the chemical industry, the oil (especially refining) and gas industries, and ferrous and non-ferrous metal production.

A lengthy table showing the production of the principal goods in 1958 includes the following items relating to the mining and metal industries: Pig iron 39,600,000 tonnes, steel 54,900,000 tonnes, iron ore 88,800,000 tonnes, coal 496,000,000 tonnes, shale 13,200,000 tonnes, oil 113,000,000 tonnes, and metallurgical equipment 173,000 tonnes.

Expressed in percentage of the 1957 production, the year's outputs of these items are 107 for both pig iron and steel, 105 for iron ore, 107 for coal and shale, 115 for oil, and 103 for metallurgical equipment. In the case of natural gas, last year's output was equivalent to 149 per cent of the 1957 figure. These percentage increases are substantial but with the exception of natural gas can scarcely be described as spectacular, even by capitalist standards!

To quote again from the report, the plan for oil extraction and the production of many oil products has been surpassed. The workers of the iron and steel industry have fulfilled ahead of time the year's plan for the entire metallurgical cycle, which has made it possible to obtain by the end of the year a substantial quantity of metal above the target. The iron and manganese mining plans have been overfulfilled. The year's targets for the production of major non-ferrous metals — aluminium, copper, lead, zinc, tin, nickel, magnesium, cobalt, titanium and molybdenum—have been attained ahead of schedule. The 1958 plan has been surpassed for the production of many major items of industrial output, including the production of coal and shale, electricity, steam turbines, electric motors of under 100 kW. capacity, turbo-drills, and coalmining combines.

The new Seven-Year Plan, which covers the years 1959-65 inclusive, provides for an average increase of 8.6 per cent per annum in the overall rate of industrial output. This compares with about 10.5 per cent during the fifth Five-Year Plan (1950-1956). In the mining and metal sectors of the economy, production of pig iron is to rise by 65-67 per cent to 65,000,000-70,000,000 tonnes and that of steel by 56-65 per cent to 86,000,000-91,000,000 tonnes. Aluminium production is to be expanded by 2.8 times, and that of refined coppper by 90 per cent. Nickel, magnesium, titanium and germanium are all to be substantially expanded. In view of the fact that only nine years have elapsed since the first diamond discoveries in Yakutia, there is particular interest in the announced intention to increase the production of diamonds during the Plan period by 14 times as compared with 1958.

About one-fifth of the total investment under the Plan will be allocated to the development of fuel and power resources. Here the most notable feature of the scheduled programme is the transfer of priority from coal to oil and natural gas. By 1965, the proportion of oil and gas in the total volume of fuel production will have increased from 31 per cent to 51 per cent, while that of coal will have fallen from 59 per cent to 43 per cent. Western observers have expressed doubt as to whether oil production can be stepped up sufficiently to reach the scheduled proportion. It is also pointed out that, even if the target is met, the total increase in energy supply will amount to only 65 per cent as compared with a total industrial growth of around 80 per cent.

In common with other Soviet politicians and economic planners, Mr. Khrushchev has set his heart on catching up with U.S. output in major sectors of the economy. This is no new ambition for Russian leaders, but Mr. Khrushchev appears to regard its fulfilment as a major aim of national economic policy, and he has given it considerable publicity in his speeches, particularly since the formulation of the Seven-Year Plan.

If the targets of the Plan are met, Russia will soon approach or surpass the United States in the output of a number of industrial products. By 1965 she hopes to take the lead in *per capita* consumption in a few sectors of the economy. Still further increases are planned by 1972.

It is noteworthy, however, that in all their references oral or written, to the race for industrial supremacy, Russian politicians and economists seem to base their calculations on the U.S. production statistics for 1957, apparently on the principle that capitalist economies are too erratic for their growth to be predictable.

Even when due allowance is made for this omission, and assuming that industrial production in the U.S. goes on growing at the post-war average of roughly 4 per cent per annum, it seems evident that, in some respects, time must be on the side of the U.S.S.R., inasmuch as a country with a relatively low standard of living has greater scope for rapid advancement than one whose economy is already very highly geared. As the U.S.S.R. itself becomes more highly industrialized, the pace of its own economic expansion will begin to slacken. Indeed, it will have been observed from the figures we have cited that the annual rate of increase postulated in the Seven-Year Plan is significantly less than that achieved in the Five-Year Plan (1950-56).

Other factors being equal, it therefore seems logical to anticipate that eventually Russia will become as highly industrialized as the United States, when the industrial outputs of the two countries will depend primarily on the domestic markets and hence on the respective populations.

Meanwhile, the Soviet policy of concentrating on the expansion of capital goods without planning for a corresponding increase in the consumer industries might conceivably have a considerable impact on world trade and also on the political situation. The expansion of non-ferrous production without *per capita* increases in domestic consumption might result in large surpluses becoming available for export, as has apparently occurred already in the case of aluminium, and possibly at the same time, the U.S.S.R. might have second thoughts about flooding the world metal markets because it would be obliged to pay increasing attention to the welfare of the under-developed countries, who would be the chief export customers of Russia's capital industries. An obvious way out is to stockpile surplus metals or minerals against future needs. If a capitalist country like the U.S. can persuade its taxpayers to finance immense stockpiling programmes, this should present no difficulty in an economy as rigidly controlled as that of the U.S.S.R.

Sooner rather than later, if Mr. Khrushchev himself is to keep faith with the Russian people, the emphasis will have to be shifted more and more to expansion of the consumer industries. Indeed, it is to be expected that, parallel with the expansion of basic industry, there will be a growing demand for goods and services which no dictator dare ignore. Once living standards are allowed to rise, Russia's chief problem, as we have previously observed (*The Mining Journal*, January 9, 1959, p. 32) may well be to find the enormous supplies of metals and minerals which will be necessary to meet the production requirements of future Seven-Year Plans.

AERIAL SURVEYS IN THE FAR EAST

Information has just been received that the completion of the first phase of a 10,000 sq. mile airborne geophysical survey in South Korea was announced recently by Aero Service Corporation, United States. This is the first airborne magnetometer survey ever undertaken in that country. The survey is being conducted by one of Aero's twin-engine Piper Apache's, fitted with a Gulf high-sensitivity magnetometer.

The first such use of a magnetometer-equipped Apache in remote foreign areas, its economical operation is said to have helped to reduce substantially the cost of overseas geophysical surveys. Approximately 3,500 sq. miles have been logged in north-east and south-east Korea since the survey began last October. Survey flights are being performed from an altitude of 500 ft. and the flight line spacing is one mile. Adverse weather conditions arrested operations during the last week of January and flying will be resumed in early April.

The preliminary interpretation of the geophysical data is to be performed in Seoul and Philadelphia under the direction of Dr. William B. Agocs, Aero's chief geophysicist. Final compilation of the magnetic maps will be done in Philadelphia.

The aerial search for iron ore is being carried out under an ICA-financed contract with the Republic of Korea Government. Its purpose is to determine the feasibility of further development of Korea's iron and steel industry, and to enlarge its reserves of iron ore.

During the winter season in Korea, Aero will transfer its crew and aircraft to Thailand for a combined magnetometer and scintillation counter survey planned to commence in mid-February. Areas in north-east, south-east and central Thailand will be probed for new deposits of iron ore and radioactive elements. Sponsored by the International Co-operation Administration, and the Government of Thailand, the project will cover nearly 4,000 sq. miles. Its completion date has been set for mid-April.

Aero's Apache will be flown to Bangkok where a survey headquarters will be established for administrative duties and preliminary data compilation.

Exploration flights over the three survey areas will be made from about 500 ft. with ¼-mile flight line spacing. Approximately thirty isomagnetic maps will be prepared at five and ten gamma contour interval, and interpretation of the geophysical information is to be performed in Bangkok and Philadelphia by Aero's geophysical staff.

Both the Korean and Thailand surveys will cost more than $200,000.

NORWEGIAN MINING IN 1958

After 12 years of steady progress and prosperity, the Norwegian mining industry experienced a heavy cutback last year, largely owing to the low prices obtaining in the world's metal markets.

The main products of Norwegian mines in 1958 were cupreous and non-cupreous pyrites, copper and copper concentrates, iron ore concentrates and ilmenite. Lesser amounts of zinc and lead concentrates, niobium-tantalum concentrates, molybdenite and graphite were also produced.

In consequence of the harder times prevailing, Norwegian pyrite producers were forced to reduce production and dismiss superfluous workmen. The reduction amounted to an average of about 10 per cent. So far, only two small pyrite mines have had to close down, but the whole industry is greatly concerned with the discovery of huge amounts of natural gas at Lacq in France, said to be planned to yield 1,000,000 tons of elementary sulphur as a by-product yearly, when fully operative. The Lacq deposits will become a competitor to the Norwegian pyrite mines.

Under the existing situation, criticism has been aroused through the knowledge that the State-owned concern, A/S Joma Bergverk, intends to put its Gjersvik mine into production to mine some 200,000 tons of copper-bearing pyrite ore yearly. It is feared that this will increase the inter-competition between the currently producing Norwegian pyrite mines. Conversely, it is argued that in two or three years the Björkaasen pyrite mine will have exhausted its ore reserves and be finished. The Gjersvik mine, the argument continues, will scarcely more than compensate for the loss of Björkaasen. Further, 10 to 15 years hence Norway's biggest pyrite producer, the Lökken mine, will also be finished.

So far on the Joma field only a main adit to reach the big orebody has been started in order to outline the ore lenses and extract crude ore for technical tests. The orebody is calculated to contain 16,000,000 tons.

Three years ago the Norwegian State took option on a newly-found copper ore field in a remote region, the most northerly in the country. The field has been geologically prospected and drilled during three summer seasons. So far, 2 - 3,000,000 tons of 1.7 per cent copper ore have been reported. The prospecting will be continued.

The iron ore mines have been better off. The biggest of them, the Sydvaranger concern, reports having maintained undiminished production in 1958, with its concentrates sold on old contracts at remunerative prices. Last year, an agreement was signed between the Norwegian State and the U.S.S.R. for utilization of the waterpower in the boundary Pasvik River. The central falls for the installation of a 64,000 kW. power supply has been allotted to Norway, and the larger part of this power will be handed over to the Sydvaranger mine, thereby relieving it of its costly coal-fired power generation. The concern hopes to be able to continue its production unaltered, and without reduction of its crew.

Norway's second major iron ore mine, the Fosdalen, has had to reduce its production by nearly 20 per cent on account of failing ore reserves. Happily, an extension in depth of its main ore zone has been discovered on the other side of a big thrust fault. This is at present being prospected by deep drilling. The mine will be opened up at a reduced pace until the new ore reserve has been developed and has reached production.

The third main iron ore producer, the Rödsand mine, has been bold enough to increase its production of titaniferous iron ore by 30 per cent last year, and plans a further increase. Its magnesite concentrate contains a notable amount of vanadium.

A few years ago a big ilmenite producer in south-western Norway, the Titania mine, discovered a new huge orebody which, after prospecting, is reported to contain at least 300,000,000 tons of titaniferous magnetic ore, of which a large part can be extracted by opencast mining. This Telnes orebody is now being developed with the aim of extracting more than 1,000,000 tons of crude ore yearly to yield 250-300,000 tons of ilmenite concentrate and a fair amount of magnetite concentrates as a by-product.

The pilot plant of the State-owned A/S Rana Gruber was started up in August, 1958, and is now producing concentrates from the low-grade Dunderland iron ore at Storforshei at the rate of 100 tons a day. The concentrates are sent to the iron ore smelter at Mo for test treatment in the electric furnaces. The pilot mill is trying out various combinations of gravimetric concentration and flotation. During the present year the decision will probably be taken as to the mining and milling of the ore on a large scale.

Norway's two lead-zinc ore mines are situated in the northern part of the country. They are comparatively small mines, extracting 150,000 tons of crude ore yearly together. This ore tonnage yields 3-4,000 tons of lead concentrates and 10-12,000 tons of zinc concentrates beside 30-40,000 tons of flotation pyrite. The mines have been kept at full production in spite of the strongly reduced prices of lead and zinc.

LIQUID GAS CARGO EN ROUTE

The first experimental cargo of 2,000 tons of liquid natural gas has just left the Gulf of Mexico for England, where it will discharge into two specially built receiver tanks at Canvey Island, Essex. The cargo has a calorific equivalent of 1,000,000 therms — sufficient to supply the normal requirements of about 1,000 householders for one year. The gas is being shipped in large 400-ton capacity rectangular aluminium tanks insulated with a 12 in. thickness of balsa wood.

The vessel is owned by British Methane, a company formed by the British Gas Council and an American company which has carried out considerable research on the practicability of the project—technically and commercially. During shipment the gas is being kept liquid at a temperature of −258 deg. F. In this state it occupies about 1/600th part of the gaseous volume at N.T.P.

The Gas Council's half share in the cost of purchase and conversion of the vessel for this trial shipment is £715,000 and the Canvey Island installations have cost a further £400,000. It is expected that large-scale imports of natural gas will result in the Gas Board being able to put gas into the mains at several pence below the cost per therm of manufactured town gas. If government backing is forthcoming several further tankers may be put into operation and the scheme widened to bring in the Venezuelan oil fields where currently huge quantities of natural gas are wasted daily by " flaring off ".

Modern Techniques in Geological Survey in Southern Rhodesia

By N. B. BROWN

DURING the field season of 1958 a survey, using the techniques of photogeology, was carried out on behalf of the Southern Rhodesia Geological Survey. The aims of the survey were firstly to provide a basic geological map at 1:50,000 scale and, secondly, to pin-point extensions of the schist belts which carry much of the economic mineralization in Southern Rhodesia.

The area lies in the catchment area of the Sabi River and forms part of the Buhera, Gutu and Bikita Native Reserves, being some 1,100 sq. miles in extent.

Prior to this survey no geological maps of the region at a scale of better than 1:1,000,000[1] existed except in the extreme north-east[2] and a small portion of the Bikita Tinfields[3] in the south-west. The survey was carried out between the months of March to September, the work being divided into three phases.

The first, or pre-field phase, was executed at the U.K. laboratories of Hunting Technical Services Ltd. It involved the study of all relevant geological data, a preliminary interpretation of aerial photographs at 1:20,000 scale and the drawing up of a provisional plan of attack. Wide-angle Wild mirror stereoscopes mounted on a Casella parallel guidance mechanism were used to study the photographs and geological detail drawn on transparent overlays to the photographs. The identification of major rock types, fracture patterns, limits of superficial deposits and structural relationships was rapidly carried out and the geological data compiled from the photographs on to a transparent overlay to a photographic mosaic at 1:50,000 scale. The pre-field interpretation, compilation and planning were achieved in a period of four to five man-weeks.

During May, June and July the second, or field phase, was carried out. In the course of the field work, traverses were made to check lithologies and structures identified in the first phase and to establish criteria for the recognition and delimitation of the lithologies which were not positively identified during the preliminary interpretation.

A very close correlation was found to exist between soil cover and solid geology thus facilitating the identification and establishing of the boundaries of the various rock types. Representative rock samples were collected for the purpose of further study in the laboratory and to assist with the writing of the report and drawing up of the map.

The third, or post-field phase, was carried out on return to England occupying the months of August and Septem-

At left, above, a typical schist-belt outcrop in syntectonic granite. This outcrop consists mainly of hornblende schist and quartzite with some banded ironstone. In the lower part of the photograph the course of two basic dykes is shown by the sub-parallel dark lines. Below, minor basic intrusives in the syntectonic granite. The basic dyke to the lower right-hand shows strong positive weathering, being a fresh, unsalted dolorite. The basic sheet (margins outlined) is a highly saussuritized gabbro and due to its alteration weathers as a negative feature

A "buck" quartz reef cutting the syntectonic granite. This body of sheared quartz extends discontinuously for upwards of 50 miles. Some blocky outcrops of an intrusive post-tectonic granite can be seen at the top and bottom of the pictures above and above left. Below, at left, is a gabbroic sheet intrusive into the post-tectonic granite showing the difference in weathering and in soils developed on the two rock types

ber. A final geological interpretation of the photographs was made incorporating the field information. The geological data were compiled on to a transparent overlay to the 1:50,000 scale topographic base maps utilizing a Zeiss Aerosketchmaster. This enabled accurate transference of geological detail to be accomplished at the same time as the scale reduction, i.e., 1:20,000 reduced to 1:50,000. Miscroscope slides of some of the rock samples were prepared for petrological examination. Compilation and fair-drawing of the maps were carried out concurrently with the writing of the geological report.

Geologically, the area consists mainly of ancient banded crystalline granitic rocks with inclusions of younger metasediments or metavolcanic rocks. Intrusive into these are younger granites which were succeeded by basic dolerite and gabbro sills and dykes. All these rocks are thought to be of Pre-Cambrian age, in fact, dating by the radio Isotope methods of some of the mineralized pegmatites in the Bikita area, has revealed that this part of Rhodesia is probably the oldest exposed area of basement rocks in the world[4] yet tested in this way. Mineralization in the metamorphic rocks of the schist belts includes copper, tin, tantalum, tungsten, lithium and beryllium.

The stereoscopic photographs show the characteristic appearance of some of the main lithologies.

All phases of the work were completed in a period of 26 to 28 working weeks—a striking example of the rapidity with which a survey can be carried out using these techniques.

Since the requirement of the work was to produce a basic geological map in such a period, other aspects of photo-interpretation were beyond the scope of the survey. One such aspect is that of lineament studies. Analysis of fracture systems in known mineralized and mining areas can yield much information of value for the exploitation geologist or mining engineer. Such studies have been carried out in the United States and Canada and are now being applied to a mining area in East Africa. Another aspect is that of hydrogeology. Structural and lithological data may be used to help in locating potential well or drill sites and for water-bearing areas. Such methods followed by ground examination in suitable places by geological or geophysical means can be of particular value to the farmer as well as the miner.

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Mining Developments in Chile

A THREATENED strike at Potrerillos, scheduled to take place on February 1, was averted at the eleventh hour when a settlement was reached. The agreement provides for a general increase in pay amounting to about 30 per cent.

Anaconda's plans for the expansion of production capacity in Chile were outlined at Santiago by the president of the company, Mr. Charles Brinkerhoff, during a recent visit. Mr. Brinkerhoff was accompanied by Mr. Clyde E. Weed, president of the board of directors, and Mr. C. J. Parkinson, a vice-president of the company.

The production capacity of Anaconda Company's Chilean mines will be raised to 405,000 tonnes of copper annually by June, 1959. To achieve this target, the company is carrying out work to extend the mines installations at a total cost of $152,000,000.

Anaconda's Chilean Mines

Anaconda's Chilean mines are the Chuquicamata, which produces electrolytic and blister copper, the Potrerillos-El Salvador Mine, which produces blister, and the La Africana Mine, which produces copper concentrates on a small scale.

Chuquicamata produced 129,165 tonnes of electrolytic and 84,403 tonnes of blister copper in 1958. Output in 1957 was 155,884 of electrolytic and 83,847 of blister. Last year Potrerillos produced 32,935 tonnes of blister copper, which was well over 6,000 tonnes less than the previous year. Mr. Brinkerhoff pointed out that, although capacity was being raised, the mines would work only according to demand. Therefore, it was impossible to predict at present when this production capacity would be reached.

The increase in productive capacity will be confined to the El Salvador mine, which will have a capacity of 100,000 tonnes. This mine will begin operations in April, 1959, and will take the place of Potrerillos, which is to be closed because of the low grade of its ore. Expansion at Chuquicamata and La Africana mines will be negligible.

The development programme for El Salvador includes exploratory drilling and the driving of four tunnels. The principal haulage way is the Inca adit, driven for two and a quarter miles from the El Inca portal. This tunnel, which was recently completed, is 14 ft. 10 in. wide and 17 ft. high. Its construction involved the removal of 400,000 tonnes of rock, the time taken amounting to 322,480 man-days of eight hours. There were no fatal casualties.

A New Enterprise

The new enterprise, Anaconda Jurden Associates Inc., under the direction of Wilbur Jurden, will be responsible for the planning and construction of electrical plants, bridges, laboratories, roads, sewers, etc. A modern village with some 1,220 very comfortable houses is being constructed. The buildings under erection include a church, recreational centres, schools, and other amenities.

An agreement involving some $U.S.5,500,000 has been signed by the Empresa Nacional de Fundiciones and a German industrial consortium headed by the firm of Klockner. Under the agreement, the German consortium will supply ENAF with machinery and also put into operation a new copper smelter to be built at Ventanas, 80 kilometres north of Valparaiso. This smelter, which will produce about 30,000 tonnes of blister copper a year, is expected to be ready for operation in two and a half years' time. The agreement stipulates that the machinery must be delivered to ANAF within 22 months.

Radioactive Minerals

Chile's Minister of Mines has announced the immediate exploitation of uranium ore by a company formed by Empresa Nacional de Fundiciones (National Smelter Co.) and Caja de Credito y Fomento Minero (Chilean Mining Bank). Six large deposits will soon be in production, and it is hoped that negotiations for the participation of foreign capital will prove successful.

In accordance with an agreement between the Chile and United States governments, two geologists from the Atomic Energy Commission, Mr. Paul Knowles and Mr. William Bowes, are investigating the principal deposits of radioactive minerals in Chile. Important deposits of uranium have been found in Canto de Agua, Atacama province, which the American geologists consider to be among the largest reserves of this strategic mineral in South America.

The discovery of large deposits of radioactive minerals in the province of Aysén has been reported by geologists of the Chilean Corporation of Development (CORFO). CORFO proposes to build a hydroelectric plant costing $U.S.3,200,000 near Tamaya in the same province.

Iron Ore Deposits

Two iron ore deposits in the province of Atacama are to be exploited by Japanese mining companies. At Las Pintadas, 20 km. from Copiapó, it is planned to install a treatment plant with a capacity of about 1,000 tonnes daily. Misubischi is to start the development of a second deposit at Las Adrianitas, also near Copiapó, with reserves estimated at 12,000,000 tonnes. The same company will spend $25,000,000 on the construction of roads, docks, and other facilities for the shipment of iron ore from a completely mechanized port at Calderilla, near the port of Caldera.

A contract has been signed in Santiago between Compania Minera Santa Fé and Eusebio de los Ríos, owners of the important iron mines, El Laco Chico and El Laco Grande and San Vincente. These mines are situated in the province of Antofagasta, Department of Loa, 172 km. from San Pedro de Atacama. Reserves are estimated at 1,000,000,000 tonnes, grading 65 per cent. The new venture will give employment to about 2,000 men, and the Santa Fé company is planning to construct roads, railways, and a mechanized port in Antofagasta. The entire output will be sold to Bethlehem Steel.

Santa Fé has also announced the discovery of large and rich iron ore deposits elsewhere in northern Chile, so that this company should have sufficient reserves to support a high level of production for many years.

The London Metal Exchange

Prepared at the request of the Board of Directors, *The London Metal Exchange* (pp. 224) is a valuable contribution to economic literature, not only as a historical record, but also because of its penetrating analysis of the factors determining the growth of this vital institution and the light it throws upon the endless controversy between the advocates of "orderly marketing" and the supporters of competition in free markets. The publishers are the Economist Intelligence Unit Ltd., 22 Ryder Street, London, S.W.1.

AS the Right Hon. Sir Oliver Franks, chairman of Lloyds Bank Ltd., points out in an illuminating foreword, it was her lead in the Industrial Revolution which made Britain a large importer and consumer of metals and hence a natural clearing house for marginal surpluses and requirements throughout the world. Its port and warehousing facilities made London the natural place for a metal market. The growing dependability of shipping made possible the next stage of development into an "arrivals" market and so paved the way for a real futures market—a market to which traders and manufacturers can resort to buy, not only the actual metal, but protection against the risk of fluctuations in the price of actual metal.

The authors trace the rise of the base metal trade and the beginning of the London market. In those early days the metal market existed only as the aggregate of numerous well-conducted individual activities ordered by usage and custom; it had neither a central organization to regulate its membership and its trading practices, nor a separate meeting place. The initial move towards a distinctive and specialized Metal Exchange came in 1869, but it was not until July, 1881, that the search for adequate premises culminated in the formation of the Metal Market and Exchange Co. to finance the construction of a suitable building in Whittington Avenue. Following delays in the completion of the building, the Exchange first met in Whittington Avenue on September 18, 1882.

The book goes on to show how efficient trading procedures were devised which enabled a growing volume of business to be handled expeditiously and how, above all, the form and details of the contracts were worked out to define the role and purpose of the market. As the metal trade became increasingly international in character, London became a clearing house for marginal supplies and requirements originating in all countries, receiving and distributing that part of world output not covered by normal trade. Nowhere else in the world was there a free and open market where large or small quantities of metal could always be readily bought and sold.

Government control of the metal trade became an unwelcome necessity during both world wars. Dealings in copper and tin were revived in 1919 without difficulty and in the same year official business in lead and zinc developed strongly for the first time; in January, 1920, dealings in these metals were admitted to the main ring. Despite unsettled business conditions in the immediate post-war years, the Exchange quickly recovered its commanding position in the world metals trade.

During the Second World War government control again brought a long period of inactivity. Substantial changes have taken place since pre-war days, both in the pattern of trade and in the practices of producers and consumers. Rising requirements for metals and continuing stockpile needs combined with a succession of hold-ups to supplies to cause a steep rise in prices and periods of marked uncertainty and instability. Nevertheless, the reopened London market has been both workable and effective; to a large extent its former usefulness and influence have been restored.

Of particular interest is the final chapter, in which the authors draw important conclusions as to the value of the Exchange as a great commodity market. They point out that the Exchange has never been primarily a market where actual lots of physical metal are bought and sold for delivery. The great bulk of transactions of this kind have always by-passed it.

Despite steady erosion in the relative importance of the London trade, the L.M.E. has been able to maintain and extend its influence at the centre of metal dealings throughout the world. It has done so because it has always provided a market where metal in large or small quantities can be sold. The shifting balance of supply and demand will always bring periods of surplus when producers are burdened by the costly accumulation of unsold stocks and when merchants and consumers find themselves holding more metal than they need. It is then that they turn to London, where on official contracts which permit the delivery of effectively all the important grades of metal in trade, a buyer for metal that is over can always be found.

This role as a clearing market is no less valuable in periods of scarcity. Buyers unable to meet their requirements in normal trade can turn to the Exchange where supplies will always be attracted as the price rises. In this way the Metal Exchange can be regarded as the safety valve of the world's metal industry, the essential means of passing on a marginal surplus or finding marginal requirements.

But the Metal Exchange is much more than a clearing market. Most of its business originates on the hedging transactions of producers, smelters, dealers and manufacturers, who seek protection against the risks inherent in handling commodities whose value is subject to constant fluctuation. Without hedging facilities, the metal industry would be at a permanent disadvantage with its initiative and competitive ability blunted by unwillingness to enter into forward commitments and with large financial resources tied up as reserves against stock depreciation and losses on forward contracts.

The clearing and hedging transactions which converge upon the Exchange are the result of a vast number of business decisons taken by producers and users of metal throughout the world. They reflect closely and reliably the multitude of conditions and events which influence the expectations and behaviour of buyers and sellers. Canalized through the competitive bids and offers of the trading member-firms, dealings in the Ring yield a sensitive and realistic price which is truly indicative of the world-wide balance of supply and demand. Experience has shown that there is no effective alternative medium to the free market for independently and efficiently determining the basis of exchange of commodities produced and consumed in conditions so diverse and competitive as those which apply to the base metals.

INNOVATIONS IN GRAVEL PUMP TREATMENT PLANT—III.

Innovations in Tin Treatment in Malaya

The following article ends the series that has presented "Innovations in Treatment Plant for Gravel Pump Tin Mines in Malaya", by J. H. Harris, Chief Research Officer, Department of Mines, Federation of Malaya. The article, published in its entirety, has been published by permission of the Chief Inspector of Mines with the authority of the Minister of Natural Resources of the Federation. The illustration shows cleaning-up operations on a palong.

THE daily recovery from the plant previously described exceeds by about 50 per cent that formerly attained by means of sluices, on the same tonnage of ground. That any increase in grade of ground treated is not solely responsible for this can be shown by the fact that demonstrable tailings losses have been cut down by a significant amount. Whereas, formerly, dulang washers working in the tailings were able to recover up to 10 pikuls per month (1 pikul equals 133⅓ lb.), the recent comparable figure has been 0.8 pikul. At the same time, a loss of extreme fines, never before suspected (because it was not reported in prospecting results or noted in palong concentrates), has now become apparent in the form of −300 mesh cassiterite in the cyclone overflow. This may amount to 1 or 2 pikuls per day. Recovery of these extreme fines, although possible, may be uneconomic. Tests will be undertaken to endeavour to collect part, at any rate, of this material.

At another mine, jig tailings containing fine cassiterite have been treated by screening on a fine sieve bend, the undersize from which has been passed via a hydrocyclone to a shaking table. Economic recoveries of −300 mesh cassiterite have thereby been achieved.

The plant is more compact and durable than a sluice. It requires less operators and can work continuously without time lost on clean up. The capital cost of the plant may amount to about $M40,000. This, amortized in five years, gives a fixed charge of $M8,000 per annum as against the cost of between $M10,000 and $M15,000 per annum for building and maintaining a palong. The power required for its operation costs no more than the labour and pumping costs for weekly sluice clean up, which have now been eliminated.

The total flow to the plant as at present set up is 60 cu. yds. per hour. In normal Malayan practice, at least four 4-cell rougher jigs would be used to treat this, and the tailing losses would be high. Here, however, it has been demonstrated that about 60 per cent of this feed can be rejected at once as slimes with no loss of recoverable tin, leaving about 25 cu. yds. per hour to be dealt with by only one 2-cell rougher jig followed by another as a scavenger, while at the same time reducing tailings losses of recoverable tin by a very great amount.

The small losses of recoverable tin in the present plant are in the tailing from the scavenger jig. This is mainly due to the fact that the locally made jig in use is not satis-

factory in operation. It is planned to replace this jig by a more efficient machine with the object of still further improved recovery.

Applications

With suitable modifications, it is considered that the plant described would be suitable for all the many hundreds of gravel pump mines in Malaya, and also for the opencast alluvial mines where the ground is excavated and transported dry and puddled before treatment. A pilot plant constructed on these lines at one of the latter type of mine has, in fact, already demonstrated the possibilities of remarkable improvement in performance.

Application to the jig plants used in dredging practice has also been considered, and there seems little doubt that improvements could also be achieved in this field. High-pressure hydrocyclones have already been successfully used on one dredge and pilot scale experiments with low-pressure hydrocyclones are planned.

The immediate value of these innovations lies in the improvement in recovery which is attained at little or no greater cost. More important than this, however, is the effect of lengthening the life of the available ore reserves by ensuring more output from the existing yardage. Furthermore, the possibility is now offered for successful retreatment of great quantities of old tailings, thus adding important tonnages to the known ore reserves.

Summary

The innovations described here are based chiefly on a novel method of coarse wet screening and on the use of low-pressure hydrocyclones at a flow rate and with a coarseness of feed not hitherto attempted. Incidental to this, it was demonstrated that, contrary to orthodox theory, jigs would give satisfactory performance on Malayan tin-bearing alluvials when presented with a long range feed in which gangue minerals preponderate in the larger sizes. The open nature of the bed so formed, it is thought, provides a system of interstices which encourages trapping of heavy mineral down to fine sizes. Significant amounts of even −300 mesh cassiterite can be caught by this means.

It will be noted, from the tin distribution figures above, that 65.2 per cent of the total tin was +85 mesh. Of this, much used to be lost in the sluice, and it was doubtful if total recovery was 50 per cent. The jigs, however, fed as described, had no difficulty in catching this and, indeed, most of the tin in the cyclone underflow, bringing the recovery to well over 70 per cent.

There seems no doubt that what used to be spoken of as "fine tin" can now be recovered for the greater part. Extreme fines, −300 mesh, the existence of which was previously practically unrecognized, are now being shown by pilot scale work to be physically recoverable, but not necessarily always economically so.

[Acknowledgement is due to Mr. Leow Yan Sip, the operator of the mine, for permission to carry out the experiments described in these articles, for much practical help and for his persistence at considerable expense in the early stages; to Inche Abdullah bin Mohamed Yusoff and Mr. I. R. M. Chaston, both Research Officers in the Research Division, the former for installation and supervision of pilot plant, and the latter for improvements in the design of hydrocyclones leading to greatly enhanced capacity and lower cost of construction; and to the Richards Construction Co. Ltd. (through their agents, Sime, Darby and Co. Ltd.) for the loan of a Yuba jig. Photographs, except where otherwise stated, are by the Research Division, and copyright is reserved by the Government of the Federation of Malaya.]

Activities of C.F.P.O. in the New Hebrides

THE Compagnie Française des Phosphates de l'Oceanie (C.F.P.O.) has its headquarters in Paris and its principal activity is on the island of Makatea, near Tahiti. The company's installations at Makatea, and particularly the arrangements for the loading of ships, were modernized in 1954. The Makatea workings can produce more than 250,000 tons of phosphate annually, and in the region of 220,000 tons are exported yearly to Japan, Australia, New Zealand, Hawaii, and India.

Although this operation is still at the height of its prosperity, researches have shown that the life of the present deposit is limited. In consequence, the C.F.P.O. began, in 1954, to prospect in the New Hebrides, using as the basis of its investigation a report by Aubert de la Rue.

A geological mission headed by Mr. J. M. Obellianne, a young geologist from the College at Nancy, explored the islands of Efate, Santo, Pentecost, Maewo, and the Torres Group during the period 1954-58. Valuable geological information was obtained everywhere and was communicated to the Condominium Mines Department. At the present stage of prospecting, however, the only deposit regarded as being immediately workable and of certain economic value is that of Forari, which was discovered in June, 1955. After very thorough geophysical study, detailed prospecting, and analyses and treatment of the ore, a project for working it has been submitted to the board, and a decision is likely in the very near future.

The deposit lies mainly to the north and on the left bank of the River Forari, extending to the upper valley of the river. The centre of gravity of the richest zone is about 3 km. from the coast. The deposit is a surface one consisting of a layer of manganese oxides, and treatment tests have shown that a marketable ore containing 46 per cent manganese may be obtained after relatively simple washing and screening. Although the rich layers are not very thick and are often rather irregular, they form a mass of some importance and of easy access. It is these factors which, especially in the case of a deposit on the edge of the sea, make for an economic proposition.

The principal installations which it would be necessary to erect are:

(*a*) In the area of the deposit, a washing plant connected to a pumping station on the River Forari;
(*b*) Near Metensa, a shelter for the generators which will provide power for the exploitation, a storage place for ore waiting to be exported, and a wharf, together with offices, workshops, store sheds, and quarters for staff and workmen;
(*c*) A small road network.

The ore would be extracted by the mechanical opencast method, using diesel-engined equipment. The ore would be transported to the washing plant and from there to the wharf in diesel lorries.

MINING MISCELLANY

Operations are due to start soon at the Luikonlahti mine in Kaavi, some thirty miles from Kuopio, in Finland. This mine is said to contain about 2,000,000 tonnes of copper ore (1.6 per cent), some zinc and silver, and small quantities of nickel and cobalt.

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Output of aluminium in Hungary during 1958 is estimated at 41,000 tonnes against 26,000 tonnes in 1957, 35,000 tonnes in 1956, and 37,000 tonnes in 1955.

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Six leading Japanese steel mills will shortly start negotiations to conclude a third long-term contract for imports of Australian coking coal. They hope to buy about 1,200,000 tons under a five-year contract. This would bring total Japanese imports of Australian coking coal over the next five years to about 3,250,000 tons.

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Eximbank's loan of $12,500,000 to Cia. Vale do Rio Doce will finance purchases in the United States of mining and transport equipment to increase exports from 3,000,000 to 6,000,000 tonnes annually. The material to be imported includes cranes, excavators, tractors, graders, drills, trucks, railway wagons, and diesel locomotives. The company owns the formerly British Itibira iron mines and the Victoria-Minas Railway, 342 miles long, connecting the mines to the Atlantic port of Victoria.

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The Brazilian Bank for Economic Development has advanced 200,000,000 cruzeiros to Companhia Mercantil e Industrial Inga towards the cost of building plant to produce metallic zinc at Itagui, State of Rio de Janeiro. Production is to start at the rate of 7,000 tons annually at the end of 1959. The company has been operating pilot plant to process calamine ores and produce metallic zinc by a new method, now patented in all the principal countries. Production, which has hitherto been at the rate of 60 tonnes of ingots annually, will be raised to 15,000 in two stages. The total investment amounts to 400,000,000 cruzeiros plus $U.S.1,000,000 for imported equipment. As reported in *The Mining Journal* of November 2, 1956, Brazil has plentiful reserves of calamine ores, with 45 per cent Zn, and Inga's method, invented by its own engineers, does not require high temperatures, avoids the risk of synthesis in the furnace, and has overcome the difficulty caused by the 25 per cent of silicate in the ores.

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The Eire Department of Industry and Commerce has placed the contract for the drilling of twenty exploratory boreholes in the coal-bearing areas of Leinster. Drilling is to be carried out under a U.S. Technical Assistance grant and will cost about £85,000. Its aim is to define existing coal seams and to evaluate the deposits. The boreholes will go down to 1,000 ft. Most of the coal produced in Eire at present is anthracite, and production totals about 150,000 tons a year. Some 50,000 tons of anthracite are imported annually, but it is hoped that in the near future the country will be able to produce at least its own requirements of this type of fuel.

With a view to facilitating sales abroad at competitive prices and simplifying exchange rates, the Brazilian Government has combined export categories Nos. 3 and 4 and increased the bonuses paid to exporters. Pig iron, iron, and manganese ores are now included in Category 3, the bonus being raised from 51.64 cruzeiros per U.S. $ (144.592 per £) to 81.64. In the case of all other mineral raw materials or industrialized products, exporters may sell their bills on the free market, where the banks' buying rate was 152 crs. per U.S. $ on January 10 (426 crs. per £).

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The Northern Miner reports that Ross Toms, a notably successful iron prospector of the Canadian North, has crowned his last year's exploits with the discovery of yet another multi-million ton low-grade iron deposit. His latest find was made on behalf of the Newfoundland-Labrador Exploration Syndicate, headed by the millionaire Cleveland industrialist, Cyrus Eaton. It was made on a 5,450 sq. mile sub-concession embracing the northernmost part of Labrador.

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The first factory in Poland to manufacture sulphuric acid from Polish sulphur is under construction at Torun and will start production this year. Hitherto, Polish production of sulphuric acid has been based mainly on imported pyrites.

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A Hungarian invention to revolutionize blasting procedure in mines was demonstrated recently at Dortmund, resulting in an immediate order from a West German firm, reports the Hungarian News and Information Service. This is the Kota sand-gun, which hydraulically forces a high-pressure sand pack around the charge set in the coal face. It is claimed that blasting procedure is safer inasmuch as, if the charge fails to explode, the sand-pack can be sucked back and the charge re-set, while the density of the pack is so great that 30 per cent less explosive is required.

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A number of Japanese companies are interested in Persian metal ore deposits, according to local Press reports. The reports state that, so far, some 10 tons of ore samples—principally lead, zinc, and chrome—have been shipped back to Japan for tests.

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Quartz of excellent quality has been discovered in the immediate vicinity of Grdelica, district of Leskovac, Yugoslavia. An analysis has shown that the quartz is 97.66 per cent pure. Geologists have estimated on the basis of surface explorations that the thickness of the quartz vein is around 15 metres.

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The revival of Scotland's iron-ore industry may occur if test borings conducted by Colvilles Ltd., Glasgow, on the Hebridean island of Tiree, reveal workable quantities of ore. According to a recent statement by Sir Andrew McCance, chairman of Colvilles, the work currently in progress is pure research. The problem of transport and the extent of the deposits would have to be considered. Hopes are nevertheless high on the island that the ore can be mined. At present, the Scottish steelworks use imported ore, but eighty years ago large quantities of iron ore used to be mined and smelted in Ayrshire and Lanarkshire.

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The official news agency "Pap" announced in Warsaw that the copper deposits discovered two years ago at Glogau, in the part of East Germany under Polish administration, had been proved to be the most extensive in Europe and among the largest in the world. According to the agency, it could be safely stated that at least 1,000,000 tonnes of pure copper could be obtained from these fields, which were thus of greater potential importance than the copper deposits at Mansfield, Eastern Germany.

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Dr. I. H. Usmani, chairman of the West Pakistan Mineral Development Corporation, referring to ore deposits discovered by the Geological Survey of Pakistan in Baluchistan and the Tribal areas, said that it was the function of the corporation to determine the exact quantities of these deposits before mining began. He stated that the corporation would concentrate on such minerals as lead, copper, zinc, and silver. At the same time, chrome, coal, and marble would not be ignored. He added that the corporation might float a company to undertake the actual mining of different ores, and many Pakistani and foreign firms might participate.

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The Canadian company, Frobisher Ltd., has been given exclusive rights "to explore and exploit the petroleum potential of an area in Central East Africa not previously tested". The agreement covers a concession of 70,000 sq. miles embracing the south-western portion of Somalia. With similar rights already held on an adjacent 5,000,000-acre tract in Kenya, the company now has exclusive exploration and exploitation rights to the entire El Wak sedimentary basin and to a portion of the sedimentary area of the Somalian coastal plain. The total area in Kenya and Somalia is 50,000,000 acres.

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A U.K. Trade and Industrial Mission will visit Ghana in March. The mission, which will be led by Sir George Binney, export director of the United Steel Companies Ltd., will leave the U.K. on Sunday, March 8, and return on March 24.

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Mapanzuri Chrome Mines (Pvt.) Ltd. are reported by Barclays Bank D.C.O. "Overseas Review" to have exercised an option to purchase chrome claims in the Belingwe Native Reserve of Southern Rhodesia. The bank states that the company has already invested £30,000 in development work and plans to spend a further £50,000 to bring the mine into production.

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Due to the changed sulphur outlook, Noranda Mines is suspending operations indefinitely at its sulphur-iron processing plant at Port Robinson, near Niagara Falls. The plant was built in 1954, when sulphur seemed likely to be a scarce world commodity. It is designed to utilize the large deposit of low-grade pyrites in the company's Horne Mine at Noranda Quebec, for the production of elemental sulphur, sulphur dioxide and high-grade iron oxide.

PERSONAL

M. Jean Dhavernas, chairman of the French company Oxy-Catalyse, has been appointed by International Nickel and Mond Nickel as special representative for Europe. He will deal particularly with Common Market matters.

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Mr. P. G. Smyrk has joined the board of Johnson Matthey and Co. Ltd. and has been appointed a joint managing director of the company. Mr. Smyrk has hitherto been the manager of the company's export division and a director of several of its overseas subsidiaries.

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Appointments recently announced by Atlas Copco include the following: Mr. Bo Englund as managing director of Atlas Copco de Portugal Ltd., Lisbon; Mr. Harry Grevby as managing director of Atlas Copco Belgique, Brussels; Mr. Stig Johannson as Portco sales manager of Atlas Copco A.B. Stockholm.

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The Hon. J. Kenneth Weir, chairman of G. and J. Weir Holdings Ltd. and G. and J. Weir Ltd., of Glasgow, has been elected a director of the International Nickel Co. of Canada Ltd. and a member of its Advisory Committee. He fills the board vacancy left by the retirement of his father, the Rt. Hon. Viscount Weir, who served as a director since 1928.

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Major William Ewart Hosking, of Redruth, Cornwall, has been elected a director of Tekka Ltd. In succession to the late Mr. Donald W. Thomas, Major Hosking has been appointed as chairman of Gopeng Consolidated Ltd., Rambutan Ltd., Tekka Ltd., and Pengkalen Ltd. These appointments became effective on January 28, 1959.

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The board of London Australian and General Exploration Co. Ltd. has accepted the resignation of Captain A. H. Moreing as director effective from January 27, 1959.

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The Mond Nickel Fellowships Committee now invites applications for the award of Mond Nickel fellowships for 1959. There are no age limits, though awards will seldom be made to persons over 35 years of age. Each fellowship will occupy one full working year. It is hoped to award five fellowships each year of an approximate value of £900-£1,200 each. Full particulars and forms of application are obtainable from the Secretary, Mond Nickel Fellowships Committee, 4 Grosvenor Gardens, London, S.W.1.

CONFERENCES AND EXHIBITIONS

The eleventh Liège International Fair is being held in Belgium from April 25 to May 10, 1959. In addition to the principal sections devoted to Mining Equipment, Metals, Mechanical and Electrical Engineering, there will be this year three special exhibitions: Plastics in Industry, Industrial Chemistry, and Water Engineering.

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Management Training (P.E.) Ltd. courses are being held from January to July, 1959. Included in the programme is a one-week course on the maintenance and management of plant, and a series of seven one-week courses in methods improvement, for the management and supervisory staff of a chemical plant.

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The Peruvian Government is sponsoring the first Pacific International Trade Fair, which will be held at Lima, Peru, from October 1 to October 18, 1959. The purpose of the Fair is to encourage the further industrialization of Peru and the neighbouring countries, Chile, Bolivia, Ecuador, and Brazil.

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Some fifty of the largest colour prints ever seen in Scotland will be on view at the Adolf Morath Exhibition of photographs of industry in colour. The exhibition, which is being held in McLellan Galleries, Sauchiehall Street, Glasgow, from February 3-11, was to be opened by Sir Andrew McCance, chairman and managing director of Colvilles Ltd. Among the finest photographs is one which was taken 1,800 ft. down at the Mufulira mine. Twenty yellow flash bulbs illuminated the scene and Morath captured the vivid blue and green veins of copper in the rock.

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The 1958 Viscount Nuffield Paper, entitled "The Production, Fabrication, Properties and Uses of Some of the Newer Metals", will be presented by Dr. N. P. Inglis (Research Director, Metals Division, I.C.I. Ltd.), in the Lecture Theatre, Department of Mechanical Engineering, University of Birmingham, on Wednesday, March 11, 1959, at 6.30 p.m.

The National Coal Development Corporation (Private) Ltd., controlled by the Indian Government, has ordered a total of 77 Euclids to help speed opencast coal production for industry. This is the largest single order ever placed by India for earthmoving equipment. It follows an order placed in 1957 for 48 similar units

COMPANY EVENTS

The south-eastern area office of Birlec Ltd., manufacturers of heat-treatment furnaces, dryers and gas plants, has been transferred to Crown House, Aldwych, London, W.C.2. The new telephone number is Temple Bar 8040. The south-eastern area office of Birlec-Efco (Melting) Ltd. has also been established at the same address.

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The first edition of *Parker Plant News*, a company newspaper produced by Frederick Parker Ltd., the Leicester engineers, has just been issued.

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Gordon Felber and Co., of Spirella House, London, W.1, have been appointed exclusive agents in the United Kingdom, West Germany, Italy, Spain, Portugal, Israel, and Indonesia, to the National Asbestos Mines Ltd., of Canada, a subsidiary of the National Gypsum Co. of America.

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On January 5, Neldco Processes Ltd. moved to new offices at Crossways House, Bracknell, Berkshire. Telephone Bracknell 1789.

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The number of pressure charges used in Nu-Swift fire extinguishers and returned during 1958 to the Nu-Swift factory for recharging was 41,167—an increase on any previous year. This figure refers only to fire-fighting in Britain by civilians.

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The inauguration of BICC's new premises at Cardiff was initiated on January 28 by Mr. W. A. Gallon, chairman of the South Wales Electricity Board. Some 150 business associates attended the ceremony in the new offices at Station Terrace, Queen Street, Cardiff. The address of BICC's branch office at Derby has been changed to Hartington Street, Derby. The telephone number remains the same (Derby 41421).

CONTRACTS AND TENDERS

An international engineering group associating French, British and U.S. companies has secured an order valued at 12,000,000,000 francs to build a 270 kms. railway line in Gaboon. The firms are Taylor Woodrow, Britain; Utah Construction, U.S.; and Cintra, France, belonging to the Schneider concern. The railway line will carry manganese ores from M'Binda to Dolisie. The deposit—one of the largest in the world with a planned output of 500,000-700,000 tonnes of ores per annum — is situated near Franceville, but a first stage will be covered by a 90 kms. cable railway. The contract for the railway construction was awarded after a tender by the Franco-American Co. Cie Minière de L'Ogooue Comilog, in which the United Steel Corporation holds 49 per cent of the capital.

Machinery and Equipment

Introducing The Hydroleg

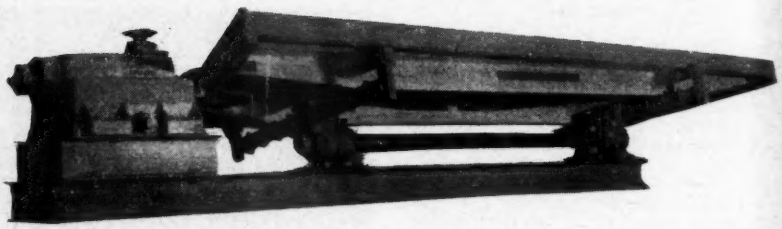
One of the recent significant developments in rock drilling is the airleg, which has been adopted widely. Now Holman Brothers Ltd., have widened still further the scope of this versatile form of feed-support by evolving the Hydroleg, which functions in the same way but uses water pressure instead of compressed air. In some of the softer measures rotary drilling is preferable to percussive drilling and in these cases it is sometimes convenient to use electric drills. Where electric tools are used a compressed air supply is not always provided but pressure water is usually available for dust control purposes and this supply is ideal for operating the Hydroleg, so ensuring faster drilling with less burden on the drill operator.

The design of the Holman Hydroleg follows closely that of the airleg with the pressure hose being attached to a twist grip valve mounted near the top end of the feed piston. This valve allows water to pass through the hollow piston rod to apply pressure beneath the piston head and is capable of controlling the feed pressure within very fine limits. To retract, when the limit of feed is reached and a new position is required, the control valve is closed and a lever adjacent to the lifting handle on the cylinder is pressed so releasing the water via a vent in the foot of the feed cylinder close to the ground.

The Hydroleg can be used: at the rock face where electric drills are employed and where no compressed air is available, providing water under pressure from 60-150 lb./sq. in. (4.2-10.5Kgs./cm.^{2}) is at hand; and in those circumstances where only low pressure air is available and where water under pressure can, as an alternative, be utilized to provide the forward feed.

Two sizes of Hydroleg are manufactured, providing a 39 in. (991 mm.) and 52 in. (1,321 mm.) length of feed respectively. The overall length of the smaller unit when closed, less drill mount, is 57$\frac{9}{16}$ in. (1,462 mm.) and when fully extended is 96$\frac{9}{16}$ in. (2,453 mm.). It weighs 29½ lb. (13.3 Kgs.). The larger unit is 70$\frac{9}{16}$ in. (1,792 mm.) long when closed and 122$\frac{9}{16}$ in. (3,113 mm.) when fully extended and weighs 39 lb. (17.6 Kgs.). Both sizes employ a 2 in. (51 mm.) bore light alloy cylinder and use ½ in. water-hose.

Drill mounts have been supplied to accommodate many types of electric and air-operated rotary drills, e.g., Climax Electric Rotary Drills, Climax Rotary Air Drills, Victor Power Feed Electric Rotary Drills, Victor Midget Electric Rotary Drills, Siemens-Schuckert Electric Rotary Drills.



Above is the underside of the Wilfley concentrating table showing the new Curnow spring suspension. The illustration shows the simplicity of the mounting, consisting of the leaf springs which support the table deck, and the heavy pedestal bearings on which the whole assembly pivots. The photograph also shows the substantial timber bracings which ensure perfect rigidity and prevent warping of the deck

Above is the Holman Hydroleg in action, providing support and forward feed to a Climax CD21X rotary air drill. The water hose coupling and twist grip valve can be seen attached to the feed piston. Below, the new Michigan backhoe attachment fitted to the 75A tractor shovel. The backhoe has travel speeds up to 27 m.p.h. The standard range of Michigan front end attachments is available

BACKHOE ATTACHMENT FOR TRACTOR SHOVELS

Michigan (Great Britain) Ltd., announce the introduction of a backhoe attachment for Models 75A, 85A and 125A. The manufacturers claim that simultaneous movements of boom and bucket can be made with ease; the simplicity of control, already a feature of the tractor, being maintained in the backhoe attachment. One lever hydraulically controls the boom action and one the bucket action. Individually adjusted outrigger unit will level the machines on slopes up to 15 deg.

The Michigan backhoe is built for rugged and speedy performance. It has travel speeds up to 27 m.p.h. and will operate over rough terrain. A series of alternative bucket sizes from 12 in. to 36 in. wide, and designs including trench buckets, bellhole buckets, grave and ejector buckets, allow a wide variety of usage. The Clamshell bucket also available is specially designed for digging straight-sided permit or bellholes, allowing down pressure as well as forward pressure for undercutting. All buckets can be exchanged on site in less than 30 minutes. In addition to the wide range of backhoe attachments, the standard range of Michigan front end attachments are available.

IMPORTANT VENT HOLE

A 1,700-ft. deep 16-in. vent hole was drilled successfully into one of the main drifts of Clear Creek Mining Co. at Idaho Springs, U.S., opening the way for extraction of new ores by providing sufficient freh air for mining operations. The hole was drilled by Minerals Engineering Co., of Grand Junction, and Franklin and Perry Drilling Co., of Ozona, Texas. In addition to acting as a duct for air flow, the hole also serves as an entrance for electric power lines.

Metals and Minerals

Tellurium Comes to the Fore

Last week (page 126) we referred briefly to the introduction of tellurium as a major component in thermo-electronics. The importance of this development to producers of a metal which is obtained solely as a by-product, is apparent from a report from the Bureau of Mines that in 1958 the U.S. tellurium industry looked to the future with optimism for the first time since commercial production of the element began thirty years ago.

In 1958, the U.S. produced tellurium as a by-product of the electrolytic production of copper and lead, the five major copper and lead companies accounting for the total output, which amounted to an estimated 125 s.tons. Consumption was placed at 105 s.tons. The price edged slightly higher during the year and on December 31 was at the 20-year average of $1.75 per lb. (In Britain, tellurium is currently quoted at 15s.-16s. per lb.)

Outside the U.S., Canada and Russia were the only significant producers. In Canada, tellurium is recovered by International Nickel as a by-product metal from its operations in the Sudbury nickel basin, and it is also a constituent of Noranda copper ores.

No major uses have hitherto been found for tellurium, which finds its principal outlets in the manufacture of alloys such as tellurium lead, tellurium copper, and various tellurium bronzes, and in the rubber industry as a secondary vulcanizing agent. Minor uses are as an additive and core wash to induce chill in the manufacture of iron castings and as a colouring agent in the production of art glass and ceramics. According to a survey prepared for the U.S. Bureau of Mines, there was virtually no world trade in tellurium in 1958.

The potential use of large quantities of tellurium as a major semi-conductor in thermo-electronics was forecast following the introduction of these new devices to the public last year. Bismuth telluride was reported to be the semi-conductor with the best performance characteristics in thermo-electric heating and cooling. Last year, however, the potential widespread use of tellurium in thermo-electronics was still in the early design and planning stage and interest in the element was not reflected in either price, production, or consumption. Numerous other thermo-electric semi-conductors were being tested and consumers were cautious because of the possibility that still more efficient replacements might be found.

I.C.I. SILICON PLANT

Imperial Chemical Industries has brought into operation a large-scale development plant for the manufacture of high-quality silicon of semi-conductor grade. This material has become increasingly important in recent years in the manufacture of semi-conductor devices such as transistors. The present cost is over £100 per lb. The I.C.I. plant is operated by the company's General Chemicals Division on Merseyside. By the middle of this year capacity will approach 4,000 lb. per annum. Plans for larger production are well advanced.

LOWER COBALT PRICES

U.K. cobalt prices have been reduced. The price of the metal is now 14s. per lb. weight, delivered, against 16s. previously, while black oxide has come down from 10s. 5d. to 9s. 1d. and grey oxide from 11s. to 9s. 8d. This is the first change for two years and reflects the increasing availability of supplies. Prices have been moving lower in recent years. Up to late 1956, for instance, the price of cobalt metal stood at 21s.

In New York, African Metals Corporation announced reduced cobalt metal prices effective February 1. Cobalt metal granules F or G sizes packed in 500-lb. drums are 1.75 c. a lb., in 100-lb. drums 1.77 c. a lb. These prices represent a reduction of 25 c. a lb. The basis of price is f.o.b. carriers, port of New York.

NEW HIGH DENSITY ALLOY

Johnson Matthey and Co. Ltd. announce that they are now producing and marketing Mallory 1000, a machinable high-density material composed of tungsten, nickel and copper and made by a special powder metallurgy technique. Mallory 1000 has a uniform structure, high strength and great density. Since the material may be subjected to all normal machining and grinding processes, it is ideally suitable for the manufacture of components where high mass, coupled with high strength and small volume, are important considerations. A further major application is in radiation shielding. By virtue of its physical structure and its very high density, the material effectively absorbs gamma rays and it can also be used for the shielding of neutron-emitting fission by-products, provided that the intensity of bombardment is relatively low.

U.S. VANADIUM EXPANSION

Indicative of the growing interest in ductile vanadium as an engineering metal (*vide* our last week's issue, p. 125), is the news that Union Carbide has tripled the capacity for vanadium of its fine metals and chemicals department at Niagara Falls, U.S.A. It is also noteworthy that in September last year consumption of vanadium in the U.S. was 15 per cent greater than in August.

AN OPTIMISTIC VIEW OF TUNGSTEN

At a time when the upward momentum of wolfram prices has abated, there may be some encouragement for the industry in the hopeful views recently expressed by Mr. R. G. Sullivan, president of Minerals Refining Co., who holds out hope that the company can resume mining, milling and refining of tungsten on a profitable basis in the second half of 1959. Mr. Sullivan states in a letter to shareholders that some of the severity of the readjustment of tungsten has now run its course and that liquidation of the company's present inventories should be substantially completed by the second half of next year, if the present rate of tungsten consumption continues.

In the U.K. the general demand for wolfram since the start of the year has been disappointing. Even so, prices have only reacted modestly, still standing at 90s.-95s. per l.ton unit, c.i.f. Europe, compared with the recent peak of 95s.-100s. Some dealers do not envisage a pick-up in demand for the time being. They point out that when ore prices were progressively advancing during the closing months of last year, ferro-tungsten buyers covered requirements for several months ahead.

GERMANY FREES PRECIOUS METALS

The West German Economics Ministry and the Federal Bank have removed all restrictions on trading in gold, silver, and other precious metals, following the introduction of full convertibility of the D-mark. From now on, residents and non-residents will be able to buy and sell precious metals in West Germany against D-marks or foreign currency. The Economics Ministry has stated that the remaining restrictions on the export of precious metals will soon be lifted.

WORK STARTS ON SURINAM PROJECT

Engineering surveys have begun for the $150,000,000 hydroelectric power project that Alcoa and the Surinam Government are to build in the Brokopondo area, 80 miles north of Paramaribo. Construction of the project, which will include a dam, a 150,000 kW. power plant and a transmission line, is scheduled to begin by next year. The power will be adequate to supply a new Alcoa aluminium smelter of 60,000 tons annual capacity. Completion of the power project is scheduled for 1965, by which time Alcoa expects to have the new smelter in operation near its bauxite mining centre at Paranam.

Last year, exports of bauxite by the Surinam Aluminium Co. declined by 10 per cent to some 2,340,000 tons, and were about 20 per cent lower than the results recorded in 1956.

INDIAN MANGANESE EXPORTS

It has been officially decided in India that concerns which are able to secure bulk business for the export of manganese ore in excess of their quotas, or which are able to negotiate sales on a long-term basis for deliveries beyond June, 1959, for three years from that date, will be considered for allotment of quotas on an *ad hoc* basis under the following conditions:

(1) The price secured by the parties must be in "reasonable parity" with international levels, at the time of the agreement;

(2) concerns which are quota holders should first exhaust their own quota. Thereafter the balance will be handled by the State Corporation without charge. The Corporation has also agreed to accommodate non-quota holders without charge.

Business continues on the light side in

the U.S. market for manganese ore with no change in quoted price rates and no further developments in the barter deal between the U.S. and India involving American grain for Indian ore.

The renewed efforts of American manganese producers to win government assistance are supported by a Bill filed by Mr. Wilbur D. Mills, chairman of the House Ways and Means Committee. This measure seeks to encourage the discovery, development and production of manganese-bearing ores in the U.S. and its territories. To be known as the Domestic Manganese Programme Extension Act of 1959, it would extend the government's manganese purchase programme under the Defence Production Act to June 30, 1964. The limit would be increased from 28,000,000 l. dry tons to 90,000,000 tons. Existing prices for U.S. purchases would be continued.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

The highlights of the last week have been the increase in the American producers' copper price accompanied by a weakening of the price structure in London; a continued upward movement in tin prices; and a continued unfavourable undertone for both lead and zinc which also showed some price movements in the downward direction.

COPPER PRICE WEAKENS IN LONDON

The U.S. producers raised their price from 29 c. per lb. to 30 c. per lb., early in the week and reports since have shown that business continues good. At the same time the customs smelter price has been maintained at the same level, and here again business is satisfactory. The volume tends to be limited by the availability of scrap, which is not plentiful.

In spite of this strength in America and continued good buying from the Continent, the London Metal Exchange quotations have shown a sharp fall and a contraction in the backwardation. The movement, which is hard to understand, was touched off on Monday by the unexpected settlement of the pending strike at Potrerillos, and the small rise in copper stocks in official warehouses. Also on that morning there was some disappointment that there was no announcement over the week-end from the U.S. producers. The settlement of the strike was certainly unexpected, as prior to the week-end the two parties were very far apart. The terms of the settlement, which gave the men an increase of 33 per cent together with some fringe benefits, seems to indicate that the employers are prepared to do all they can to prevent strikes in the present circumstances of the copper market. This attitude may have some bearing on the negotiations in the United States itself in the middle of the year.

The stocks in official L.M.E. warehouses showed an increase of 350 tons at 4,711 tons, and this had the immediate effect of narrowing the backwardation. It should be noted, however, that the total stocks available to the Exchange are still extremely small. There was some fairly consistent selling during the first three days of the week but this was well absorbed at the lower price levels and the majority opinion seems to be that although the downward movement can continue, it is unlikely to go very much further and will probably be followed by an appreciable recovery.

The only figures of interest published during the week are those which show that the Union Minière du Haut-Katanga produced 235,500 tonnes of copper during 1958, which shows that the projected 10 per cent reduction in output was not in fact adhered to and it is noted that production was increased in October.

TIN MOVING HIGHER

The strength in the tin market has been maintained, although the upward movement has been very gradual. Stocks in official warehouses showed a further decrease of 447 tons at the beginning of the week, giving a total of 14,628 tons. In spite of this, however, the prices for cash and forward metal remain approximately the same. Consumer demand remains good and it is now confidently expected that the price will soon reach the level at which the buffer stock manager will be able to start liquidating some of the official stocks in his possesion.

Tin shipments from Malaya during January showed an increase over those for December, as was to be expected with the commencement of a new quota period. A total of 102 tons were shipped from Singapore as compared with 49½ tons in the previous month and from Penang the total was 3,371 tons as compared with 1,732½ tons in December.

On Thursday morning the Eastern price was equivalent to £802½ per ton c.i.f. Europe.

WEAK LEAD-ZINC UNDERTONE

The tone of the lead and zinc markets remains very weak with no further news of barter transactions and with the confirmation that the International meeting scheduled for February has now been postponed. The majority of the business on the Exchange has been the extension of existing positions and very little new business seems to have taken place. Consumer demand for lead remains very spasmodic and it is described in some quarters as being disappointing. In the zinc market, however, there are still reasonable enquiries especially from the galvanizing and die casting sections of the industry and numerous orders have been booked.

Closing prices and turnovers are:

	Jan. 29		Feb. 5	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£240½	£240¾	£231	£231½
Three months	£235	£235½	£230	£230¾
Settlement	£240½		£231½	
Week's turnover	10,625 tons		12,800 tons	
LEAD				
Current ½ month	£71	£71⅛	£70⅝	£70½
Three months	£71⅛	£71¼	£70½	£70⅝
Week's turnover	7,675 tons		7,875 tons	
TIN				
Cash	£765½	£766	£770½	£771
Three months	£765	£765½	£771	£772
Settlement	£766		£771	
Week's turnover	380 tons		1,675 tons	
ZINC				
Current ½ month	£73½	£73⅝	£71½	£72⅛
Three months	£72⅛	£72⅜	£70½	£71
Week's turnover	10,425 tons		6,200 tons	

LONDON METAL AND ORE PRICES, FEB. 5, 1959

METAL PRICES

Aluminium, 99.5%, £180 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Crude (70%) £190 per ton
Ore (60%) bases 19s. 6d./20s. 6d. nom. per unit, c.i.f.

Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 9s. 6d. lb.
Cerium (99%) net, £16 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 14s. lb.
Germanium. 99.99%, Ge. kilo lots 2s. 5d. per gram.
Gold, 249s. 6½d.
Iridium, £19/£21 oz. nom.
Lanthanum (98/99%) 15s. per gram.
Manganese Metal (96% - 98%) £245/£250
Magnesium, 2s. 3d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £16/£17 oz. nom.
Osmiridium, nom.
Palladium, £5/£5 15s.
Platinum U.K. and Empire Refined £19 10s. oz.
Imported £17 5s./£17 15s
Quicksilver, £74 0s. ex-warehouse
Rhodium, £40/41 oz.
Ruthenium, £13/£15 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 76¾d. f. oz. spot and 76¾d. f'd
Tellurium, 15s./16s. lb.

ORES AND OXIDES

Bismuth			65% 8s. 6d. lb. c.i.f. 18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—			
Rhodesian Metallurgical (semifriable) 48%	(Ratio 3 : 1)		£15 15s. 0d. per ton c.i.f.
" Hard Lumpy 45%	(Ratio 3 : 1)		£15 10s. 0d. per ton c.i.f.
" Refractory 40%			£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3 : 1)		£14 0s. 0d. per ton c.i.f.
Baluchistan 48%	(Ratio 3 : 1)		£11 15s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade			nom.
Fluorspar—			
Acid Grade, Flotated Material			£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)			156s. 0d. ex works
Lithium Ore—			
Petalite min. 3½% Li_2O			40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O			40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O			£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined			£28 0s./£30 0s. d/d
Magnesite Raw (ground)			£21 0s./£23 0s. d/d
Manganese Ore Indian—			
Europe (46% - 48%) basis 55s. 0d. freight			nom.
Manganese Ore (43% - 45%)			nom.
Manganese Ore (38% - 40%)			nom.
Molybdenite (85%) basis			8s. 11d. per lb. (f.o.b.)
Titanium Ore—			
Rutile 95/97% TiO_2 (prompt delivery)			£35/£36 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO_2			£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)			90s. 0d./95s. 0d. per unit c.i.f.
Vanadium—			
Fused oxide 95% V_2O_5			8s./8s. 11d. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65 - 66% ZrO_2)			£14 0s. ton c.i.f.

Mining Finance

Free State Geduld Makes The Grade

With the 5s. shares up to the record level of 151s. 3d. at one time, shareholders in Free State Geduld have at last had their killing after, in many cases, a long wait which had seen the price down to under £3 less than two years ago. The hope of an exceptionally rich reef strike had always given considerable speculative glamour to this Orange Free State gold share. The only surprise when it came at the end of last week was that it was in development from the No. 1 shaft, not from No. 2 which had provided much the richer reef to date as well as having its workings approaching the immediate vicinity of the Geduld No. 1 borehole which yielded a fabulous 23,037 in. dwt. some twelve years ago.

The gold value of 9,772 in. dwt. now obtained from 215 ft. of reef sampled on the 45th level from the No. 1 shaft occurred at a point nearly 1¼ miles away from this borehole. A little of the gilt was taken off the gingerbread by the fact that the strike took place in the footwall of the reef after the haulage and companion airway had passed through a reverse fault. The reef, subsequently, became faulted into the hanging wall by another section of the reverse fault. This faulting has two significances. Firstly, it could, at the worst, mean that the rich gold deposition may be not much more than a fairly restricted pocket. Secondly, it means that it will be, to quote the chairman, Mr. S. Spiro, some months before further reef intersections can be expected.

Mr. Spiro's comment was cautious but hopeful. He pointed out that the values occurred over an area of only 110 ft. on the dip by 50 ft. on the strike. However, he went on, viewing these latest results in conjunction with the values disclosed in underground boreholes drilled from the 47th level it was possible to deduce that a substantial zone of high values existed south-west of No. 1 shaft. The strike occurred not far from the western boundary, but Free State Geduld is protected in this direction because it has the right to extend its lease area if necessary.

In the meantime, F.S.G. shares are likely to remain an exciting market over the next few months. For one thing a drilling programme is being instituted from the 45th level to probe the reef in the faulted area. It is possible that the first results from this might be included in the March quarterly due in mid-April even if this report is hardly likely to contain any fresh actual development data.

At 147s. 6d., F.S.G. are capitalized in the market at £73,750,000. Are they worth such a fabulous figure? They could be on, say, a five-year view presuming that this south-western segment of the mine is going to provide ore reserves with an average gold content of well over an ounce per ton as now seems likely. After that, when development starts expanding further to the north and east, the mine may begin to move into a more doubtful and less rich era.

Development Summary

The development results for the period December 31 to January 23 for Free State Geduld and the other O.F.S. mines of the Anglo American group that held their meetings last week are summarized in the following table which also in each case gives the figures for the December quarter.

	Ft. sampled	Payability %	Inch dwt.
F.S. Geduld—			
No. 1 Shaft—			
To Jan. 23 ...	405	83	6,447
Dec. qtr. ...	1,325	82	1,041
No. 2 Shaft—			
To Jan. 23 ...	140	100	973
Dec. qtr. ...	1,325	100	1,639
President Brand—			
To Jan. 23 ...	505	80	1,473
Dec. qtr. ...	1,745	80	1,067
President Steyn—			
Basal Reef—			
To Jan. 23 ...	530	89	608
Dec. qtr. ...	3,050	92	483
Leader Reef—			
To Jan. 23 ...	155	26	303
Dec. qtr. ...	45	Nil	—
Welkom—			
To Jan. 23 ...	1,455	72	405
Dec. qtr. ...	5,495	66	383
West Holdings—			
To Jan. 23 ...	745	83	887
Dec. qtr. ...	3,610	90	951

President Brand expects to bring its No. 2 sub-vertical shaft system into full commission by next July. The start of work from this shaft in the central southern part of the mine has taken on added potential significance since borehole SP6 gave the high gold value of 3.376 in. dwt. from a complete reef exposure at a depth of 7,240 ft. at a point about half-way between the No. 2 shaft and the common boundary with President Steyn.

LONDON MARKET HIGHLIGHTS

Gold shares came into their own in a big way last week. There was no doubt that the previous week's news of phenomenally high gold values at Free State Geduld triggered off the buying movement which was led by shares in the Orange Free State group. Free State Geduld themselves settled down to around 145s. after the previous week's rise of over 21s.

Stimulating the inherent firmness of Kaffirs, was a statement from the American-South African Investment Company which while mentioning the increase in A.S.I.C. asset value, carried a forecast from the director, Mr. Richdale, that another U.S. sponsored South African Gold share trust was likely to be launched soon. Mr. Richdale reaffirmed his conviction that a rise in the gold price would come within four or five years after 1960.

With the outlook becoming more obscure in the industrial market sections, Kaffirs took wings and as a result the *F.T. Gold Share Index* advanced to its best since March, 1956. Activity soared to the highest level for several years and while much of it was confined to the O.F.S. market, there were signs later in the week of the demand broadening into the Far West Rand mines.

The January profit returns made a good impression, particularly on the price of Harmony which rose to 44s. following the mine's latest record profit figure. Western Holdings (135s.) also earned more last month and this may well have encouraged some switching into the shares from Free State Geduld. A spurt of 4s. to 34s. in Loraine caught the market short of stock when Cape buyers came forward on talk there of high values in the Riebeeck section of the property. "Ofsits" (92s. 3d.) mirrored the strength of the O.F.S. group as a whole.

Meanwhile, some explanation of the recent buying of "Freddies" made its appearance in the shape of an announcement regarding the company's new prospecting programme south of the Vaal river. The news having been previously discounted, "Freddies" gained a modest 6d. to 9s. 6d. Otherwise, St. Helena (59s.) strengthened on a heavy buying order and Finance House shares moved ahead. Good gains were recorded in Central Mining (80s. 9d.), "Johnnies" (59s.) and General Mining (130s.).

Vaal Reefs improved to 39s. 6d. as buyers began to look around for shares in young mines that had been overlooked in the first flurry of demand. Vaal Reefs may well go a lot higher. At the present price the shares yield as much as 8.9 per cent, a generous return on a young expanding mine of this calibre.

Copper shares remained indecisive. The L.M.E. price suffered a setback on the news that the threatened Chilean labour strike at Potrerillos had been overcome. But there were one or two firm spots in London. Among them, Chartered advanced to 78s. 9d. in anticipation of the final dividend and a steady investment demand lifted Mangula to an all-time peak of 10s. 7½d.

San Francisco Mines of Mexico were unsettled by the lack of a dividend and tumbled to 16s. On the other hand, an unexplained bout of U.S. buying lifted Burma Mines 10½d. to 2s. 10½d.; the demand ended as quickly as it had begun and the shares then slipped back to 2s. 6d.

PLATINUM GLEAM

No great joy, but a little hope. This sums up Mr. D. A. B. Watson's speech at this Thursday's annual meeting of Rustenburg Platinum Mines, the big South African producer of this metal. The nub of his statement was that he could not at this stage forecast when the company would resume payment of dividends. The position remained extremely uncertain and it would be necessary to assess the results of the present financial year next September in the light of future market conditions at the time before deciding upon the magnitude of the appropriations that would have to be made, not only for the repayment of the outstanding loan but also for possible future contingencies. (See page 156.)

The ray of hope came from two things. Present indications after five months' operations in the financial period to August 31 next were that sales would be at a higher level than the

(*Continued on page* 155)

SAN FRANCISCO MINES OF MEXICO, LIMITED

STATEMENT BY THE CHAIRMAN, Mr. A. V. CONRAD

The Forty-Sixth Annual General Meeting of San Francisco Mines of Mexico Limited will be held on February 26 at the Chartered Insurance Institute, 20 Aldermanbury, London, E.C.2.

The following is the statement by **Mr. A. V. Conrad,** the Chairman, which has been circulated with the report and accounts :—

During the year, Mr. H. K. Hochschild, who for many years led The American Metal Company with great distinction, retired from some of his business activities including his position as a Director of your Company. Mr. Hochschild was a member of your Board for nine years. In his place, his colleague Mr. E. T. Rose was co-opted to the Board and you will be asked to confirm Mr. Rose's appointment at the forthcoming Annual General Meeting.

In my statement last year I expressed the opinion that the Company might be fortunate to escape operating at a loss. It was not fortunate. The price of lead, upon which the Company's profitability so largely depends, was materially lower in the second half of the year under review, the New York price falling from 13 cents. per lb. in February to a low of 10¼ cents. per lb. in August. Moreover, as you are doubtless aware, the U.S. Government imposed quotas on the duty-paid imports of lead and zinc as from October 1, 1958, and as a consequence the Company has since then not been free, as heretofore, to sell its entire current output of these metals in that country. In the circumstances your Directors have considered it prudent to value the Company's stocks of lead and zinc (both in concentrates and in refined form) in Mexico at September 30, 1958, on the basis of the London prices for these metals (these values being below estimated cost) and not on the basis of the higher U.S. prices ruling at the date.

The outcome is a loss for the year of £208,000. Your Directors much regret that this year, for the first time for eighteen years, the Company is unable to pay a dividend. Deducting the year's loss from the balance on Profit and Loss Account of £454,000 brought forward at October 1, 1957, leaves £246,000 to be carried forward to 1958/59.

Taxation

As you will have seen from paragraph 2 of the Directors' Report, the loss of £208,000 has been arrived at after charging no less than £1,456,000 in taxes ! All but £38,000 of this sum represents Mexican export, production and mercantile taxes on gross revenue. The penal nature of Mexican taxation could hardly be more clearly demonstrated. Mexican law provides for relief of losses by remission of export and production taxes up to a maximum of 75 per cent. of the Federal Government's participation in these taxes. In the case of small miners the relief is automatic. In the case of larger producers the relief has to be negotiated. At the present time there are few Mexican producers not in receipt of such relief. This Company is one of the few. The Company applied for relief in May 1958, but so far has had no response to its application. To the extent the Company makes losses which are unrelieved, gross taxes are in effect a tax on its capital. Although a favourable response to the Company's application would be welcome, relief of losses alone will do but little to redress the penal burden of tax suffered.

The Mining Industry in Mexico continues to decline under the oppressive weight of taxes on gross revenue. Ore reserves of existing mines in Mexico are on the whole being rapidly depleted, while the search for new deposits which could otherwise be expected to make good this depletion is inhibited at the outset by the present fiscal system. This is a serious matter for Mexico because the Mining Industry is the backbone of the country's economy. The problem is of course well known to those in authority in Mexico. As a unit of the Mexican Mining Industry we can but hope that the new Administration of President Lopez Mateos will seize the opportunity offered by the reduced, albeit substantial, contribution of the Mining Industry to the Federal Budget during the current period of low base metal prices to abolish the present system of gross taxes and create an economic climate in which the industry can expand to the benefit not merely of those of us who risk our money in pursuing our activity, but of the country as a whole.

Cash Drain

The difficult trading conditions prevailing during the year resulted in an increase in the Company's stocks of lead and zinc and a corresponding drain on the Company's cash resources. These changes are reflected in the make-up of the Current Assets in the Balance Sheet at the end of the year. The Company has refrained from pressing its entire production for sale on a sensitive market during a period of low metal prices, but while it may expect in due course to profit thereby, there is a limit to the amount of cash which the Company can prudently tie up in stocks. Whenever possible cash has been and continues to be conserved. "Stores and Materials" have been reduced. The Collective Labour Contract, however, prevents the Company from reducing its labour force. Accordingly, so long as the alternative to operating normally is to pay workmen for being idle, there is little the Company can do to reduce its cash outlay—although some reduction of the labour force (men previously engaged on construction) has, rather exceptionally, been permitted by the Ministry of Labour.

Operations

The operations at the Company's mines during the year show little change from the previous year. As forecast a year ago, the breakdown of the hoist at the North shaft of the Frisco mine in October 1957 resulted in a lower tonnage being milled than in 1956-57. The opportunity was taken to proceed with the installation of the larger hoist required to bring ore to the surface from greater depth and also some years hence, to enable a greater tonnage of ore to be hoisted from the Frisco Mine to offset a decline in the tonnage from the Clarines Mine as the latter becomes worked out.

The grade of ore milled was very close to that of the previous year.

As expected, improvements in metallurgy in 1957/58 were smaller than in recent years, but nevertheless welcome. With the bringing into operation of the new crushing plant, the programme of expanding and improving the mill plant and related facilities, which has been going on for some years, was completed.

Because of the labour force which the Company was required to retain in employment, the amount of development work was continued at the high level of the previous year. However, a greater proportion of the distance driven was this year on veins. The work was again mainly confined to the Frisco mine and the results continued to be satisfactory. The Ore Reserves increased by nearly 10 per cent. to a total of over 5½ million metric tons of slightly higher grade—sufficient to supply the mill at full capacity for seven years.

The Current Year

Since the end of the financial year, two events of importance to the Company have occurred, both for the worse.

First, following an increase in the Mexican national cost of living index, a country-wide demand arose in September 1958 for higher wages in various industries including the Mining Industry. After neighbouring producers had agreed to increase wages by 12 per cent., to avoid a strike we had to concede a like increase as from October 27, 1958, even though at that time the Company was making losses and the Collective Labour Contract had not expired. Moreover, in our own locality there was no evidence of an increase in the cost of living of our workmen. The Collective Contract has been extended for two years from the original expiry date, i.e., until June 1961. We must expect enhanced labour costs to raise total costs during the coming year.

The second unfortunate event was the imposition by the U.S. Government of quota restrictions on duty-paid imports into the U.S.A. of lead and zinc equal to 80 per cent. of the average annual figures in 1953-57. For the three months ended December 31, 1958, the Mexican Government sub-divided these quotas among the various Mexican producers. The quotas thus assigned to the Company entitled it to sell to the U.S.A. during the quarter only about half of its production of lead and two-thirds of its production of zinc concentrates. The Company's quotas for the quarter January-March 1959 have yet to be determined by the Mexican Government but so far, in common with other producers, it has been granted on account an allocation of 80 per cent. of its quotas in the previous quarter. Hitherto, as a natural consequence of its geographical position, the bulk of the Company's production of lead and the whole

of its production of zinc concentrates were sold to the U.S.A. Drastic limitation of current sales to the U.S.A. is a serious matter for the Company and for the zinc smelting company in the U.S.A. which for a generation has depended upon our zinc concentrates for its feed. We can but hope that the U.S. quotas will not long endure.

The effect on the Company of the above two events has been mitigated in recent months by the material rise in the prices of lead and zinc in the U.S.A. and the maintenance, at least, of prices elsewhere. On balance, there is little evidence so far to encourage the expectation of a substantial improvement in the profitability of the Company's operations in 1958-59 such as would render resumption of dividend payments likely. World overproduction of lead and zinc continues and no international scheme restricting output has yet been agreed. However, ups and downs in the base metal business are to be expected and if industrial recovery in the U.S.A. continues to progress, as it has been doing, consumption of lead and zinc should increase. With our mines in first-class shape and ready to take advantage of an increase in base metal prices we can confidently anticipate a return to profit-earning in due course.

Once again I am sure you will wish me to convey to Mr. H. B. Hanson, our General Manager in Mexico, to Mr. A. B. O'Neel, our Assistant General Manager and to a loyal staff our appreciation of their efforts on behalf of the Company.

Rand and Orange Free State Returns for January

Company	January 1959 Tons (000)	Yield (oz.)	Profit† (£000)	Year ends	Current Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)	Last Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)
Goldfields										
Doornfontein	88	36,520	182·2	J	613	255,769	1335·4	600	247,377	1393·9
Libanon	98	23,220	53·0	J	686	161,910	379·5	809	160,858	372·7
Luipaards Vlei	70	12,254	5·5	J	490	84,604	38·4	510	91,011	55·5
Rietfontein	16	4,348	8·8	D	16	4,348	8·8	23	5,354	15·0
Robinson	66	14,110	L14·3	D	66	14,110	L14·3	73	15,640	7·3
Simmer & Jack	90	17,200	10·2	D	90	17,200	10·2	92	17,346	17·5
Sub Nigel	66	15,907	23·8	J	463	111,689	175·4	462	117,549	199·6
Venterspost	123	31,279	55·4	J	892	222,295	408·6	850	205,392	391·8
Vlakfontein	50	17,929	85·5	D	50	17,929	85·5	48	17,067	81·7
Vogels	90	20,610	40·5	D	90	20,610	40·5	96	21,914	46·7
West Drie	82	78,319	636·7	J	564	538,791	4405·9	525	503,832	4220·5
Anglo American										
Brakpan	140	16,500	11·1	D	140	16,500	11·1	125	18,147	11·5
Daggas	227	46,426	243·1	D	227	46,426	243·1	217	46,000	236·8
East Daggas	91	15,110	27·1	D	91	15,110	27·1	90	15,000	27·6
F.S. Geduld	73	55,663	405·2	S	294	219,997	1605·8	254	180,641	1243·1
President Brand	95	72,418	602·3	S	385	289,712	2411·4	279	210,822	1688·9
President Steyn	94	36,566	191·1	S	365	142,637	726·3	370	141,224	860·6
S.A. Lands	90	18,935	54·2	D	90	18,935	54·2	86	17,750	50·2
Springs	104	14,220	10·0	D	104	14,220	10·0	126	14,180	9·0
Vaal Reefs	78	35,491	200·0	D	78	35,491	200·0	68	30,365	177·2
Welkom	90	27,482	75·2	S	360	108,869	307·3	322	95,363	254·9
Western Holdings	100	60,001	460·5	S	396	233,113	1763·8	387	199,917	1456·7
West. Reefs Ex.	110	28,051	75·4	D	110	28,051	75·4	109	25,344	57·5
Central Mining										
Blyvoor	106	69,704	504·1	J	731	480,168	3486·4	720	426,488	3031·2
City Deep	117	24,446	12·1	D	117	24,446	12·1	148	28,048	10·1
Cons. M.R.	118	20,116	14·3	J	997	142,094	102·8	1,157	159,313	68·4
Crown	232	35,826	9·0	D	232	35,826	9·0	231	35,604	17·2
D. Roodepoort	190	34,694	53·8	D	190	34,694	53·8	185	33,136	52·5
East Rand Prop.	223	57,169	125·6	D	223	57,169	125·6	225	57,021	151·6
Harmony	112	44,802	184·3	J	696	279,390	1099·6	571	228,906	1138·7
Modder East	141	13,541	2·7	J	941	93,010	14·9	966	97,454	20·4
Rose Deep	38	5,619	L0·6	D	38	5,619	L0·6	56	7,845	3·2
J.C.I.*										
E. Champ d'Or	12	284	L26·7	D	12	284	L26·7	12	285	L28·2
Freddies Cons.	57	13,754	L34·8	D	57	13,754	L34·8	45	15,684	L17·5
Govt. G.M.A.	64	10,958	L8·1	D	64	10,958	L8·1	65	11,392	1·3
Randfontein	29	4,808	5·1	D	29	4,808	5·1	179	4,097	5·1
Union Corporation										
East Geduld	137	42,141	293·3	D	137	42,141	293·3	127	39,053	266·7
Geduld Prop.	72	12,790	13·2	D	72	12,790	13·2	86	13,620	11·4
Grootvlei	205	43,451	215·2	D	205	43,451	215·2	195	41,544	211·5
Marievale	90	22,857	107·9	D	90	22,857	107·9	73	19,166	84·4
St. Helena	140	40,741	211·3	D	140	40,741	211·3	118	34,696	186·7
Van Dyk	78	14,695	30·0	D	78	14,695	30·0	77	13,592	20·2
Winkelhaak	71	16,245	18·1	D	71	16,245	18·1	—	—	—
General Mining										
Buffelsfontein	122	41,674	191·4	J	843	285,197	1305·8	770	251,374	1342·3
Ellaton	30	7,079	30·1	D	30	7,079	30·1	32	7,294	38·0
S. Roodepoort	31	7,440	24·3	J	210	49,710	167·7	208	48,822	177·9
Stilfontein	125	63,875	417·4	D	125	63,875	417·4	108	53,662	375·2
W. Rand Cons.	129	18,825	17·9	D	129	18,825	17·9	107	14,333	L27·9
Anglo Transvaal										
Hartebeestfontein	86	46,870	322·4	J	608	333,100	2243·8	599	328,615	2220·1
Loraine	73	14,418	L15·9	S	296	57,806	L72·8	247	48,175	L57·9
N. Klerksdorp	9	988	L8·4	D	9	988	L8·4	9	868	L9·3
Rand Leases	181	26,698	14·9	J	1,263	183,749	85·7	1,210	183,781	63·4
Village M.R.	27	4,895	1·8	J	190	33,303	5·8	231	37,504	38·2
Virginia O.F.S.	114	29,070	24·9	J	779	202,658	284·0	710	172,188	445·7
Others										
N. Kleinfontein	84	11,004	3·5	D	84	11,004	3·5	94	11,540	0·5
Wit Nigel	18	4,374	5·6	J	125	30,227	42·8	125	29,846	32·1

Gold has been valued at 249s. 5d. (December 249s. 9d.) per oz. fine. L indicates loss. † Working Profit. *Working Profit includes sundry revenue. Table excludes profits from Uranium, Pyrite and Acid, and also production from Uranium divisions at Luipaards Vlei, Randfonte in and W. Rand Consolidated.

MINING FINANCE—*Continued*

sharply cut back level for 1957-58. A significant reduction in metal stocks should thus take place. If prices did not fall further there should thus be sufficient profits to extinguish, if the board should so decide, the present deficit of approximately £1,000,000 and to leave a surplus in hand.

At the moment the Johnson Matthey price for platinum, which is the operative one for Rustenburg, is £19 10s. per oz. against an average of £27 15s. in the year to August 31 last. And there is no sign of any recovery in the so-called free market price which is lower still. This free market price in New York could well be the one to watch for those who think that there will come a time when platinum shares will once again offer scope for appreciation. A turn-round in this price could precede a move in the official South African and Canadian quotations by a useful margin of time.

There is no market in Rustenburg's own shares. They are held as to 43.3 per cent by Potgietersrust Platinums, 39.2 per cent by Waterval (Rustenburg) Platinum and 17.5 per cent by Union Platinum. None of these concerns is currently in the dividend list owing to Rustenburg's own defection in this respect. Potgietersrust 9d. shares are currently 6s. 1¼d., Waterval 2s. 6d. shares 9s. and Union 5s. shares 8s.

SAN FRANCISCO'S LAST STRAW

The San Francisco Mines of Mexico tax situation has now become even more unreal as a result of the low prices for lead and zinc in the year to last September. This meant that the company made a loss of £208,000 after providing £1,456,000 for tax. As the chairman, Mr. A. V. Conrad, points out in his statement with the annual report, this unfortunate position arises for the usual reason, namely that the bulk of the tax consists of Mexican export, production and mercantile charges not on profits but on gross revenue. It is a tribute to the 'Frisco mine and its organization that in the past worthwhile profits have been made despite this burden and also despite a labour cost bill that has once again gone up in the current financial year.

On top of all this the company is suffering from the U.S. import quotas on the two metals which hit it particularly hard owing to that country being, for geographical reasons, its chief customer. It is understandable in all these circumstances that Mr. Conrad cannot hold out any hopes of a dividend resumption in 1958-59, although "with our mines in first-class shape and ready to take advantage of an increase in base metal prices we can confidently anticipate a return to profit-earning in due course". It is the first time for eighteen years that 'Frisco has had to pass its dividend. The 10s. units are **16s. 3d.**

ACROSS THE RIVER

A river is not a natural geological boundary. There is thus no reason why the reef formations that have made successful gold mines out of Western Reefs, Vaal Reefs and Buffelsfontein should not extend to the south beyond the Vaal river. It was years ago when a good deal of digging was done on this northernmost edge of the Orange Free State by Western Holdings and Union Corporation. The latter company never

(*Continued on page* 157)

POTGIETERSRUST PLATINUMS LIMITED
UNION PLATINUM MINING COMPANY LIMITED
WATERVAL (RUSTENBURG) PLATINUM MINING COMPANY LIMITED

(Each Incorporated in the Union of South Africa)

For the information of Members, the abovenamed companies publish below an extract from the speech made by Mr. D. A. B. Watson, the Chairman of Rustenburg Platinum Mines Limited, at the Twenty-seventh Annual General Meeting of Members of that Company held at Johannesburg on February 5, 1959.

Johannesburg.
February 5, 1959.

RUSTENBURG PLATINUM MINES LIMITED

(Incorporated in the Union of South Africa)

EXTRACT FROM CHAIRMAN'S SPEECH

The Twenty-seventh Annual General Meeting of Members was held at Johannesburg on February 5, 1959. **Mr. D. A. B. Watson** (Chairman) presided and, in the course of his speech, said :—

"Financial Results for the year ended August 31, 1958:

The profit from the sale of metals during the year ended August 31, 1958, before providing for transfers to and from Reserves, and before providing for taxation, was £1,519,000 as compared with £4,480,000 for the previous year. Revenue from the sales of metals other than platinum, although somewhat lower than in the previous year, was at a reasonably satisfactory level and the two main factors which adversely affected trading results were, firstly, the decline in the volume of the sales of platinum to approximately 50% of that for the preceding year and, secondly, the fall in the official retail price of the metal to an average of £27. 15s. 0d. as compared with a price of £34 per ounce during the twelve months ended August, 1957.

The estimated tax liability arising from the year's operations and from adjustments to previous assessments amounted to £116,000. An amount of £589,000 was transferred to the Stock Realization Reserve, being the value of the increased stocks of metals at cost of production. Net capital expenditure amounted to £294,000, and after adjusting for sundry expenditure and revenue and bringing into account the sum of £178,000 arising from a reduction in the value of stores and materials on hand, the balance of the year's profits was approximately £680,000.

During the year a loan of £1M. was obtained from The Standard Bank, repayable over a period of five years at a rate of not less than £200,000 per annum. The first repayment falls due in April, 1959. This loan was raised to finance current operations and the term of five years was arranged to afford an opportunity to extend, if considered desirable, the period over which the deficit in funds as at August 31, 1958, will be extinguished by appropriations from current profits.

In considering the question of a dividend for the year ended August 31, 1958, the Board of Directors decided that, because of the uncertainty of the platinum metal market, no dividend should be paid in respect of that year, and that the whole of the available profit of about £680,000 should be applied towards a reduction of the deficit in the amount of the funds which had been provided to meet expenditure incurred up to August 31, 1957. After applying the sum of £680,000 to this purpose, the amount still to be provided in respect of past expenditure amounted, at August 31, 1958, to approximately £1M.

Operations:

Early in the calendar year 1958 output at the mines was reduced to a rate below the estimated level of sales, and that rate of production has since been maintained. Both Rustenburg and Union sections are operating, certain advantages being gained by the continuance of production at the latter mine at a low milling rate and at a low cost of production. The mines have been and will be maintained in such conditions that mine output can immediately be increased if necessary.

Stocks:

During the first six months of the past financial year, mine production of platinum was in excess of sales, which had declined rapidly and progressively during the same period. As a consequence, the total stocks of platinum increased during the year under review. A relatively satisfactory level of sales was achieved in respect of the by-product metals, stocks of which remained virtually unchanged. The value, at cost of production, of the increase during the year, in stocks of all metals was approximately £589,000.

The value of the increase in stocks during the previous financial year 1957 was £895,000, and therefore during the past two financial years nearly £1½M. was appropriated to finance the increase in metal stocks. It is of interest to note that this figure, which represents the cost of production of tangible assets in the form of stocks of metal which can in due course be realized, is in fact greater than the deficit of approximately £1M. between expenditure and funds provided up to August 31, 1958.

Demand:

During the financial year under review, the pattern of demand remained more or less constant. Of the decrease in the total volume of sales during the year compared with the previous year, about two-thirds occurred in the United States and about one-third in the United Kingdom.

The consumption of platinum by industrial users in countries other than the U.S.A. and the U.K. remained at relatively satisfactory levels and in the case of certain countries whose industrial development is advancing, previous levels of consumption were in fact well maintained.

The U.S.A. is, however, by far the largest single consumer and that country and the U.K. constitute our most important markets. The decline in consumption by those two countries has therefore overshadowed the variations in demand by other consumers.

As regards sales of platinum to the different types of industrial users, diminished demand from oil refineries in the United Kingdom and the United States accounted for about 70% of the decline in the company's total sales in those two countries.

Supplies:

The supply position remains easy with Russia offering platinum relatively freely in various markets. Total exports from Russia to the Western countries, in so far as these can be determined, were less during the period under review than in each of the previous two years. These sales were nevertheless material, and have had and continue to have a marked effect on the platinum market.

As regards the International Nickel Company of Canada, the mine output of unrefined platinum group metals as by-products of nickel was probably reduced during 1958 as a result of the curtailment of nickel production to a rate equivalent to about two-thirds of the normal rate. That company's operations were, furthermore, interrupted by a strike which continued virtually throughout the last three months of 1958. On the termination of the strike, the company announced that production of nickel was to be resumed at a rate which is equivalent to about 80% of the rate of production at the end of 1957. Despite the reduction in mine output during the calendar year 1958, the refined output of platinum group metals by the International Nickel Company may not necessarily have been materially reduced during that year, but a reduction in refined output during the current year can reasonably be anticipated.

The other platinum producers throughout the world which operate individually on a relatively small scale have in the aggregate produced less platinum during 1958 than in previous years.

A quantity of platinum scrap was released by U.S. authorities during the calendar year 1958 with some adverse effect on the market. The quantity released was immediately absorbed by dealers.

Price:

Supplies from Russia provide a strong competitive element in the markets with a consequential depressing effect upon prices. The drop in the official price of Rustenburg metal from £34 in 1957 to an average of £27. 15s. 0d. in 1958, and

to the present figure of £19. 10s. 0d., is a most serious factor affecting the profitability of the operations of this company, but for so long as other producers are prepared to reduce their prices in an endeavour to obtain additional sales in the present restricted world markets, we have no alternative but to remain in a fully competitive position by continuing to match our prices with those of other producers and sellers.

The continuous decline of the past eighteen months has resulted, in my opinion, in a price of platinum which is too low when considered in relation to the capital employed in the production and refining of platinum, and the financing of the necessary pipelines of unrefined metals and the trading stocks of refined metals. Again, when considered historically, the increase in the price of platinum from $37 in 1939 and to $52 in 1959 at the present moment is on a lower scale than the increases which have occurred in the prices of other industrial metals over the same period.

In my opinion, the price of platinum is now at such a level as to be likely in due course to discourage a continuance of the free flow of platinum on to the world markets.

Future Outlook:

As stated previously, 70% of the decline in the company's total sales of platinum has been occasioned by the marked reduction in sales to the oil industry throughout the world. At the present time there is no significant change in the position as regards this industry, whose reduced requirements for platinum during the past year have to a large extent been met from its accumulated stocks. The number, and total capacity, of oil refining plants throughout the world are, however, both increasing and there are good grounds to believe that this increase will continue. At the moment there are no indications of any major changes in the techniques involved in the production of high octane fuel by the use of platinum catalysts. Should no adverse change occur, and if the increase in world refining capacity continues as expected, there is every likelihood that overall sales of platinum to the oil industry will again increase as stocks now in the hands of oil refining companies become depleted.

The economy of the United States appears at present to be moving forward out of the recent recession and, should this movement continue, the expansion of industrial activity is likely to assist the market for platinum. Since the end of the financial year 1958, there have in fact been signs in the United States of an increased interest by industrial users, other than oil refiners.

There has in recent months been some slowing down in the rate at which the price of platinum has fallen but there is at present no indication of any hardening of the price, which may indeed decline further. Neither is there any firm sign of the material reduction in the oversupplied state of the market which is a prerequisite for a return to more rational prices.

Changes in the platinum market tend to be rapid, whichever way they develop, and it is always difficult to forecast the future position of this company. Present indications, however, after five months' operations during the current financial year, are that sales will be at a higher level than they were during the year ended August 31, 1958.

Given the presently indicated volume of sales of platinum and the associated platinum group metals, copper and nickel, in relation to the current rate of production, there will be a significant reduction during the current year in the available stocks of metals held by us and, particularly, in the stocks of platinum. Provided that there is no material reduction in prices over the balance of the current year and provided that sales remain in accordance with present indications, it appears that operations for the year ending August 31, 1959, should, after a substantial transfer of funds from the Stock Realization Reserve in respect of metals sold out of stocks, yield sufficient profit to extinguish, if we so decide, the present deficit in funds of approximately £1M. and to leave a surplus in hand.

This forecast is contingent, as I have said, upon the continuance of the present indicated level of sales and upon prices remaining at about the present level.

I wish to draw attention to various factors which will favourably affect the financial position during the current year but which are likely to operate less favourably in future years. Firstly, the hoped-for improvement in the financial position, if it is achieved, will arise largely from the disposal of a considerable portion of the excess stock of platinum which was produced last year and the year before in anticipation of a higher level of sales during the year's 1958, 1959 and 1960. The depletion of stocks against a low level of production cannot continue indefinitely, and therefore the improvement in the company's financial position which may arise from the reduction of stocks during the current year will not necessarily be repeated in subsequent years.

Secondly, as a result of heavy capital expenditure in recent years a considerable sum is available as a redemption allowance to set off against profits for tax purposes for the current year. Present indications are that the tax liability during the year ending August 31, 1959, will be insignificant. Although further amounts will be allowable for redemption after the end of the current year, the effective rate of tax levied on profits in subsequent years is likely to increase, the rate of increase being dependent naturally upon the profits earned during such years.

Thirdly, although it is anticipated that there will be virtually no capital expenditure during the current year, it will be necessary at some stage in the future to undertake certain work of a capital nature which has been deferred during the present period of reduced sales.

At the same time therefore as indicating to shareholders the possibility that the current year's operations may result in an improvement in the financial position sufficient to convert the present deficit in funds into a surplus, I wish to emphasize that such results, if achieved, will not necessarily be indicative of the results which may flow from a similar level of sales in future years when some or all of the favourable factors which I have outlined above may no longer be operating.

I am not prepared at this stage to forecast when this company will resume the payment of dividends. The position remains extremely uncertain and it will be necessary to assess the results of the financial year in September, 1959, in the light of probable future market conditions at that time before deciding upon the magnitude of the appropriations to be made to provide. not only for the repayment of the outstanding loan, but also for possible future contingencies.

I should report that Rustenburg has recently been informed that it will shortly be gazetted as a controlled mine of Group B in accordance with the provisions of the Pneumoconiosis Act, 1956 (Act No. 57 of 1956). It is not expected that this will have any significant effect upon working costs."

MINING FINANCE—*Continued*

published the results. The former did, but they were not very exciting commercially.

Nevertheless, it is hardly surprising that Free State Development and Investment Corporation has now decided to put down two further boreholes in this region. They are to be on the ground to the south of Buffelsfontein in an area where "Freddies" has 50 per cent subscription and 80 per cent vendor rights in any company that may be formed to exploit the farms Grootvadersbosch 470, Die Hoek 114 and Doornkom Oost 447.

One borehole on the western boundary of the area, about 5,000 ft. south of the river, is to be put down jointly with Western Holdings which owns the mineral rights over the ground to the west. The other on the eastern boundary, about 4,000 ft. south of the river, is to be sunk in conjunction with Rand Mines which has rights to the east of the area. Drilling is to be started "in the near future". From the previous evidence the chances are against any exciting results. But in mining there is always a possibility of a good strike. The news explains the recent speculative buying of "Freddies" 5s. shares which have risen to 9s. 6d., their best price since 1955.

O.T.C. STATUS FOR GHANA MAIN REEF

As foreshadowed here a fortnight ago, the dividend declarations of Ghana Main Reef, the Ghana gold producer in the Western Selection group, were partly based on the company having decided to become an O.T.C. for tax purposes. In the full report it is revealed that steps are being taken to qualify in this respect from April 6 next. Thus, the interim of 7½ per cent and the bonus of 2½ per cent for the year to June 30, 1959, are in respect of "the remaining pre-O.T.C. period".

In other words, the company is passing on to shareholders the anticipatory benefits of its future tax status. It is difficult at this stage to estimate exactly what dividend basis this puts the 5s. units on for yield calculation purposes. The chairman, Mr. C. J. Burns, will perhaps be more explicit on this point at the meeting on February 27. Meanwhile, the units at 2s. 4¼d. ex dividend hardly look overvalued.

Technical Briefs

Adsorption Kinetics Applied to Flotation

In *Adsorption Kinetics Applied to Flotation*, by H. Marchandise, and published as IMM Bulletin No. 625 of December, 1958, the author provided some new experimental data. There did not appear, however, to be sufficient evidence for many of the conclusions made, and certainly they could not justify his contention that flotation collection is almost invariably due to adsorption. Yet he has succeeded in drawing attention to the fact that many flotation effects are reversible depending on the order of reagent addition when one reagent can replace another—a fact which is not unknown. Such modification and replacement of collector films has been known for some time, and use has been made of the fact in many cleaning operations.

Soviet investigators have developed the technique to a considerable extent, using the so-called "desorption" technique, although at least four years ago sodium polysulphide was being used with ferrocyanide at Morenci to depress copper minerals, when recovering molybdenite in a bulk concentrate.

One of the examples given, however, is the more interesting, involving the separation of manganese oxide from quartz, which is troublesome, as manganese ions activate the quartz and the manganese mineral floats over a narrower pH range than the activated quartz, whilst no depressors are particularly effective.

If the mixture is conditioned with a fatty acid, and later the pH modified or tannic acid added, depression of the quartz occurs, but the manganese oxide floats. In other words, the bond between activated quartz and fatty acid can be displaced. Unfortunately, however, no investigations appear to have been made on a manganese ore, where such phenomena as slime coating can occur, and conditions generally can be very different from those in the laboratory and employing synthetic mixtures. Nevertheless, such techniques are of considerable interest and may point the way in other fields where such procedure as the "revised conditioning" suggested by the author is not unknown, but probably has not been used to the extent it may deserve.

FLOTATION SAVES TUNGSTEN VALUES

The recent application of flotation to tungsten concentration has resulted in improved recoveries, which consequently widened the range of ores that could be economically handled. Flotation is usually used in conjunction with gravity as a scavenger operation to recover slimed scheelite. In general, gravity means are used to recover coarse scheelite and/or wolframite at a coarse grind. Concentrates thus obtained are, if required, raised to market specifications by flotation for removal of impurities such as sulphides and free mineral. A further grading of gravity concentrates is obtained by leaching for removal of non-metallic constituents. Magnetic concentration is also extensively used for removal of high gravity material such as garnet.

Flotation is also extensively used in tungsten milling for removal of iron and other sulphides ahead of the actual application of flotation for concentrating the tungsten mineral. The grade of tungsten flotation concentrate produced is dependent on the type of ore being treated, but in most cases the grade is too low to satisfy market requirements. In ores containing considerable amounts of calcite and other carbonates, grade is a problem, especially where the mineral is finely disseminated. In siliceous ores free from carbonates, a fairly high-grade concentrate can be produced. In either case, flotation concentrates are raised in grade by gravity or direct chemical treatment.

ELECTROSTATICS IN POTASH BENEFICIATION

Usually the separation of sylvite (KCl) and halite (WaCl) is carried out by flotation in saturated brines, which, of course, involves the circulation of large amounts of the solution as well as losses to the solubility of the sylvite, and any method involving the separation of dry feed has a number of advantages. In view of this, laboratory investigations have been undertaken employing electrostatic separation with some degree of success.

The separation is accomplished by first heat-treating the ore to allow for electric charging of the particles. Preferential exchange of electrical charges between different mineral particles through surface contact is the principal mechanism involved.

After such heating, in the case of Carlsbad ores to 800 to 900 deg. F., the material is allowed to cool to about 250 deg. F. This permits the heated air from the cooler to be utilized as secondary air in the kiln. It is then dropped vertically into a horizontal electric field having a field gradient of about 5,000 to 15,000 volts per inch. Usually about 90,000 volts is necessary, but power consumption is extremely low.

It has been found necessary to maintain a certain temperature for satisfactory separation, and rougher concentrate must be retreated before cleaning and recleaning. The type of separator used consists simply of two plates, between which the falling stream is allowed to fall freely through the zone of voltage drop when the particles are deflected either towards the positively or negatively charged plate.

Repeated treatment is necessary, using rougher, scavenger, and two cleaning stages, each unit consisting of three pairs of electrodes, suitably arranged. By this means, it is possible to make a 95 per cent KCl concentrate from a feed carrying 20 to 30 per cent KCl, rejecting a tailing with 5 per cent KCl. At present, the feed must be crushed to 14 mesh, and it is not possible to treat the −150 mesh fraction at the same time. Further work is reported to be in hand on this problem.

By using the same process, it has also been found that coarse Florida pebble phosphate, too low in grade to find a ready market, can be upgraded by removing some of the silica. Normally, froth flotation is employed to deal with the −35 mesh, and table agglomeration or spiral treatment for the size fraction between 1 mm. and 35 mesh. Above 1 mm. the product is normally simply washed from the clay, but tests have shown that by crushing to about 14 mesh in an impactor, and employing electrostatic separation using the Le Baron-Lawver, free falling pieces, it is possible in two stages to upgrade a 60 per cent B.P.L. material to from 73 to 77 per cent B.P.L. with 90 per cent recovery.

With the phosphate rock, however, it has only been found necessary to heat to 300 deg. F. to 350 deg. F., followed by cooling to around 200 deg. F. to 250 deg. F. before passing it through the free fall separator, which is 6 ft. to 9 ft. high, whilst a potential difference of 40 kV. to 70 kV. is required. The quartz and phosphate bearing negative and positive charges respectively are deflected in opposite directions by the external electric field.

Similar processing is also reported to have been tested on feldspar for some years, and a pilot plant is operating involving preheating to 250 deg. F. to 300 deg. F., followed by separation using rougher and scavenger operation.

It is also interesting to note the use of a Geiger counter as a method of determining the approximate potash content of samples, both in feldspar and in sylvite rock. Such a method is speedy and is said to be sufficiently accurate for control purposes in treatment plants.

AMINES AS SULPHIDE FLOTATION REAGENTS

Urmas Runolinna in "Experimental evaluation of amines and xanthates as flotation reagents for sulphide ores" (Z. Erjbergb. Metallhutten, May, 1958) gives the results of extensive experiments on the flotation of Finnish sulphide ores, using both xanthates and short and long chain amines or quarternary ammonium compounds.

In general, the sulphide minerals respond to amine collection much in the same way as with xanthates, but the former are claimed to be more selective. When using amines, the shorter chain type are less effective, but more selective, and secondary amines are more effective than primary or tertiary amines.

With amines, action is non-selective in acid pulps, as with xanthates, and normally cyanide is a depressor, whilst sphalerite floats using fatty amines without activation.